Pinkerton Forest and Bush's Paddock:

flora and fauna

Project: 06-71

Prepared for:

Western Water and Melton Shire Council

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Background

Ecology Australia Pty Ltd. was commissioned by Western Water and Melton Shire Council to conduct a flora and fauna assessment of Pinkerton Forest (which is located within Western Water's property 'Surbiton Park) and Bush's Paddock (which abuts Surbiton Park) in Mt Cottrell. The report includes the existing and potential values of the sites and details future management strategies.

Pinkerton Forest has been subject to extensive grazing in the past by cattle and sheep and is still grazed by rabbits. The site is c. 35 hectares in area and was first fenced in 1992, an additional area was fenced in 2005. The vegetation is comprised of mature mostly Plains Woodland dominated by Grey Box (*Eucalyptus microcarpa*), with a sparse understorey dominated by indigenous grasses. Pinkerton Forest is managed by Pinkerton Landcare and Environment Group (since 1992) supported by Western Water.

Bush's Paddock of c.45 ha is located on the western side of Mt Cottrell Road in Mt Cottrell and has had a long history of stock grazing, however, plantings and weed and pest animal control has recently been undertaken to restore the site. The site was purchased by the Shire of Melton in 1997 to act as a buffer to a proposed adjacent quarry. The vegetation is also Plains Woodland dominated by Grey Box and large areas of native grassland. Bush's Paddock is managed by the Shire of Melton and Pinkerton Landcare and Environment Group (since 1999).

Flora

A total of 143 plant species was recorded at both sites (135 species were recorded at Bush's Paddock and 48 were recorded at Pinkerton Forest). Eighty-two of these (57%) were indigenous. One species, Clover Glycine (*Glycine latrobeana*), listed under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and Victorian *Flora and Fauna Guarantee Act 1988* was recorded at Pinkerton Forest. A further five species of State significance were also recorded. One of these species, Werribee Blue Box (*Eucalyptus* sp. aff. *baueriana* (Werribee) is a local endemic which will soon be described as *Eucalyptus baueriana* subsp. *thalacina* (K. Rule pers. comm.). Its conservation status is endangered in Victoria and Australia.

Bush's Paddock contains four ecological vegetation classes: Plains Woodland, Plains Grassy Woodland, Low-rainfall Plains Grassland and Wetland Formation. Pinkerton Forest contains Plains Woodland only. Plains Woodland, Plains Grassy Woodland and Low-rainfall Plains Grassland are all endangered in the Victorian Volcanic Plain bioregion.

Habitat hectare assessment according to benchmark conditions indicates that the Plains Woodland at both sites are of similarly high quality (Pinkerton Forest: 60% of pre-European condition, Bush's Paddock: 61% of pre-European condition) and very high conservation significance. The Plains Grassy Woodland at Bush's Paddock is of low to moderate quality (31% of pre-European condition) and high conservation significance.

There are two distinct floristic types of Low-rainfall Plains Grassland within Bush's Paddock, one is dominated by Kangaroo Grass (*Themeda triandra*); the other is dominated by Spear-grass (*Austrostipa spp.*) and Wallaby-grasses (*Austrodanthonia* spp.). The *Themeda* grassland was of relatively high quality (both unburnt 56% of pre-European condition, and burnt parts 58% of pre-European condition) and very high conservation significance. The *Austrodanthonia-Austrostipa* grassland was of lower quality (39% of pre-European condition) but still of high conservation significance.

The Wetland Formation is located in a small farm dam, but the suite of species indicates well developed and diverse wetland vegetation. However, this vegetation type was not assessed using habitat hectares because it is not remnant and of a small size.

In order to assess the suitability of Bush's Paddock and Pinkerton Forest as BushBroker sites, the potential gains in native vegetation quality and quantity from improved protection and management was calculated. The potential gain for Bush's Paddock, if it was used as an offset site is c. 3.5 habitat hectares. The potential gain for Pinkerton Forest, if it was used as an offset site is c. 5.3 habitat hectares.

Fauna

A total of 65 fauna species was recorded during the field survey, including 44 bird species (five exotic), 11 mammal species (three exotic), one reptile species, two frog species and seven invertebrate species (one exotic).

Three threatened bird species were recorded during the field survey and the study area supports one threatened bird community: Diamond Firetail (*Climacteris picumnus*) is listed under the FFG Act 1988; Brown Treecreeper (*Stagonopleura guttata*) is classified as Near Threatened by DSE (2003); and Jacky Winter (*Microeca fascinans*) has declined markedly acrossits former range and is a member of the FFG-listed 'Victorian Temperate Woodland Bird Community'.

Important habitat fetures in Pinkerton Forest include: hollow-bearing trees and ground-layer cover such as logs, leaf litter, and exposed rock. Trees in Bush's Paddock are much younger than those in Pinkerton Forest; the development of hollows, dead stags and fallen logs is therefore at a very early stage. The shrub layer in both sites is very sparse and mid-storey cover is essentially non-existent.

In a landscape ecology context it is clear that, particularly for birds, the Eynesbury, Pinkerton and Bush's Paddock patches function as a single system and each one is important for ongoing ecological function in the others. The significance of either Pinkerton Forest or Bush's Paddock would be diminished if the connection with Eynesbury was lost or impeded. Therefore,, maintaining and enhancing links between these patches should be high priorities for future management actions.

Management

Pinkerton Forest and Bush's Paddock have been managed by Pinkerton Landcare and Environment Group who have clearly had a large positive impact at both sites. Prior management works have included extensive weed control, particularly Serrated Tussock (**Nassella trichotoma*) and

Boxthorn (**Lycium ferocossimum*); biomass reduction in the grasslands of Bush's Paddock; and supplementary planting. However further weed control, indigenous planting and pest animal control are advocated.

The following management recommendations are made:

1 Plan a detailed 5-year, area-by-area revegetation program as a corollary to weed management activities. Ensure appropriate lead-times for contractor to produce tubestock for the revegetation program.

2 Revegetation should include Fragrant Saltbush (*Rhagodia parabolica*) but not Seaberry Saltbush (*Rhagodia candolleana*). Fragrant Saltbush occurs naturally in Grey Box vegetation of the region, whereas Seaberry Saltbush is coastal, or rarely subcoastal. It has however become very abundant in Sugar Gum (*#Eucalyptus cladocalyx*) plantations at Werribee Treatment Plant complex.

3 Sheep grazing should be used for biomass recution at a frequency and timing to be resolved.

4 Ensure all aspects of management (weed control, revegetation, rabbit control etc.) are adequately documented as a permanent record. Include the provenance of all material used for revegetation and enrichment planting.

5 Continue the regular bird surveys by the Bird Observers Club of Victoria, but attempt to target survey effort more evenly amongst the months and seasons, in order to provide more temporally representative sampling.

6 Survey for and ensure clear marking of the remnant indigenous flora (mostly individuals or small populations of plant species) to protect plants during weed management activities.

7 Ensure monitoring protocols are in place to keep track of weed control and revegetation exercises and to identify management requirements in a timely fashion.

8 It is essential to devise and implement a rabbit control program.

9 Cease irrigation of woodlands with wastewater because of potential to alter hydrology, increase nutrients in the soil and exacerbate weed invasion.

10 Build a rabbit proof fence around Bush's Paddock.

11 Survey outside the fenced area of Pinkerton Forest to locate all Werribee Blue Box (*Eucalyptus* sp. aff. *baueriana* (Werribee)) at Surbiton Park. These should be incorporated in the fenced area of Pinkerton Forest, as appropriate.

12 Seed should be collected from all plants of Werribee Blue Box and placed in a seed bank, for instance at the Royal Botanic Gardens and by the Pinkerton Landcare and Environment Group, and used for revegetation.

13 Surveys for Golden Sun Moth could be undertaken in the grassland habitats during the appropriate season (e.g. roughly between mid to late November and early January).

14 A supplementary flora survey should be conducted in Spring of 2007 assuming reasonable rainfall to confirm the existence of some of the species recorded and record additional species.

15 Consider supplementing the stock of logs in the ground in both patches (from outside sources), particularly in Bush's Paddock.

16 We recommend that the Bush Stone-curlew should **not** be reintroduced to Pinkerton Forest/Bush's Paddock.

17 The most important fauna conservation priorities for Pinkerton Forest/Bush's Paddock should be to protect and enhance the existing populations of threatened woodland birds, such as Diamond Firetail, Jacky Winter and Brown Treecreeper.

18 Once a middle-storey layer of *Acacia*, and other shrubs and smaller trees, has been established in Pinkerton Forest/Bush's Paddock, we recommend that reintroduction of the Sugar Glider *Petaurus breviceps* be contemplated as an option. This species has been successfully reintroduced elsewhere in Victoria (e.g. Tower Hill), and would be likely to be successful at Pinkerton Forest/Bush's Paddock.

19 Maintain and enhance existing habitat links between Eynesbury and Pinkerton Forest and Bush's Paddock to enhance fauna movement between the areas.

1 Introduction

Ecology Australia Pty Ltd. was commissioned by Western Water and Melton Shire Council to conduct a flora and fauna assessment of Pinkerton Forest and Bush's Paddock in Mt Cottrell.

Pinkerton Forest is a remnant patch of vegetation located within Western Water's property known as Surbiton Park. This park abuts the Werribee River and includes the 'Melton Waste Water Treatment Plant'. Bush's paddock is a larger property which adjoins Surbiton Park on the eastern side.

The requirements for this project were to conduct flora and fauna surveys and report on the existing and potential values of the sites, and most importantly to detail future management strategies. Specifically, the objectives were to:

- review all existing data and ecological reports for the area;
- conduct detailed field surveys;
- identify the existing and potential values;
- identify existing and potential threats/impacts to flora and fauna values;
- determine the potential of the sites to support rare and/or threatened flora and fauna species or ecological communities;
- assess the suitability of the sites for BushBroker; and
- provide recommendations for improving existing management strategies.

2 Study Area

The study area is located in Mt Cottrell, c. 30 km west of Melbourne's CBD. The study area is comprised of two sites: Pinkerton Forest and Bush's Paddock. Pinkerton Forest is within Western Water's 'Melton Waste Water Treatment Plant' (known as Surbiton Park) and Bush's Paddock adjoins the Treatment Plant on the north-east side (on the western side of Mt Cottrell Road) (Figure 1).

Surbiton Park includes lagoons, irrigated and dry-land grazing and cropping associated with the wastewater treatment plant, plus areas of remnant vegetation, including Pinkerton Forest and riparian vegetation along the Werribee River. The Werribee River is located c. 1 km to the west and Mount Cottrell is located c. 600 m to the east of Bush's Paddock and 1 km to the east of Pinkerton Forest.

The study area lies within the Werribee Plains of the Newer Volcanics. The geology is described as olivine basalt with alkaline derivatives; limburgite; scoria; minor and tuff sand (Geological Survey of Victoria 1989). There is also scattered surface volcanic rock (Frood et al. 2003). Annual rainfall is between 400 and 500 mm.

The study area lies within the Victorian Volcanic Plain Bioregion and is in the Shire of Melton. There is an Environmental Significance Overlay (ESO1) for both sites.

2.1 Pinkerton Forest

Pinkerton Forest is within the south-west section of Surbiton Park and has been subject to extensive grazing in the past by cattle and sheep and is still grazed by rabbits. The site is c. 35 hectares in area and in 1992 approximately 22 hectares was fenced off from Surbiton Park and associated activities, an additional c.14 hectares was fenced in 2005. Responsibility for Surbiton Park was transferred from Melton Shire to Western Water in 1994 when the latter was appointed Melton's water service provider. The vegetation is comprised of mature mostly Grey Box (*Eucalyptus microcarpa*) Woodland, with a sparse understorey dominated by indigenous grasses. Some plantings of the indigenous Kangaroo Grass (*Themeda triandra*) have been carried out by Melton Skillshare Horticulture students. Pinkerton Forest is managed by Pinkerton Landcare and Environment Group (since 1992) supported by Western Water.

2.2 Bush's Paddock

Bush's Paddock of c.45 ha is located on the western side of Mt Cottrell Road in Mt Cottrell and has had a long history of stock grazing, however, plantings and weed and pest animal control has recently been undertaken to restore the site. The site was purchased by the Shire of Melton in 1997 to act as a buffer to a proposed adjacent quarry. The vegetation is also Grey Box Woodland and large areas of native grassland. Bush's Paddock is managed by the Shire of Melton and Pinkerton Landcare and Environment Group (since 1999).

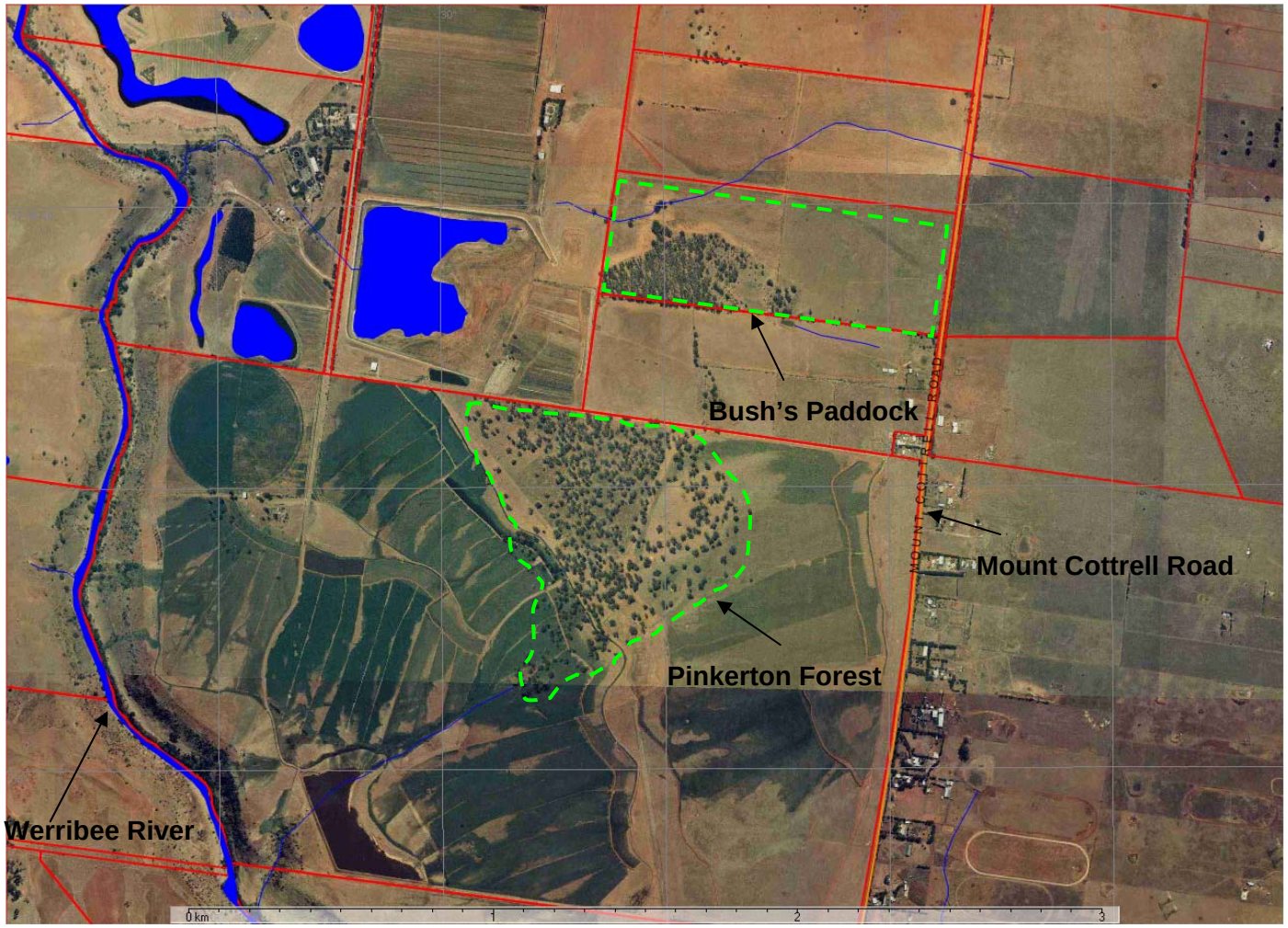

Figure 1: Aerial photograph of the study area, showing Pinkerton Forest and Bush's Paddock (TumAus 2005)

3 Methods

3.1 Desktop review

Existing information was reviewed, including:

- flora records within 5 km of the subject land (referred to as the Data Review Area – DRA) held in the Victorian Flora Information System, a state-wide database maintained by the Department of Sustainability and Environment (DSE 2004a).
- Department of Environment and Heritage Protected Matters Database (DEH 2004), using a 5 km radius search area.
- Ecological Vegetation Class mapping/modelling of the area (both extant and pre-1750) (DSE 2003)
- aerial photography from the mapping tool Tumaus (Vision Software 2003); and
- previous reports from the study area (Ecology Australia 1994, 2001; Frood et al. 2003).
- Occurrence data from recent bird surveys conducted in the area by the Bird Observers Club of Australia (per Dave Torr)

3.2 Field Survey

3.2.1 Flora

Vegetation sampling

The property was visited on 21 and 22 November 2006 and was traversed on foot to record plant species and vegetation communities. Ten quadrats were sampled in Bush's Paddock and four quadrats were sampled in Pinkerton Forest to collect detailed data on the floristic composition and structure of vegetation types present (Figure 2). This sampling method involved recording all indigenous and exotic vascular plant species in c. 700 m^2 (typically 30 m diameter circles) and assigning a visually assessed cover/abundance value to each species from the Braun-Blanquet cover/abundance scale (Gullan 1978):

+ cover < 5%, few individuals
1 cover< 5%, any number of individuals
2 cover 5-20%, any number of individuals
3 cover 20-50%, any number of individuals
4 cover 50-75%, any number of individuals
5 cover 75-100%, any number of individuals

Floristic data collected within quadrats, and as incidental records, were entered into the Flora Information System (FIS) database, and will be made available to the administrators of this

database at DSE. The FIS was also used to generate an inventory of plant species recorded during the survey.

Determination of Ecological Vegetation Classes

Remnant native vegetation in the study area was assigned to Ecological Vegetation Classes (EVCs) by reference to the EVC benchmarks (DSE 2005b) and descriptions (Oates and Taranto 2001).

Vegetation condition

In accordance with the requirements of Net Gain (see DNRE 2002) the condition of native vegetation and habitat features within the study site was assessed by comparison with the appropriate EVC 'benchmark'. Benchmarks represent the average characteristics of a mature and apparently long-undisturbed stand of the same type of vegetation (DNRE 2002). A condition score (out of 100) can then be calculated.

To assess vegetation and habitat condition across the study area, four DSE Vegetation Quality Field Assessment Sheets (Version 1.3 – October 2004) were completed for Bush's Paddock and one for Pinkerton Forest. Each EVC and major condition zone was assessed.

3.2.2 Fauna

Habitat assessment

The site was assessed for its fauna habitat values. This involved review of aerial photographs to gain an appreciation of the vegetation cover and to place the study area in a broader landscape context.

During the site visit, the habitat assessment focused on the extent of native vegetation cover, composition, structure and other features important in determining habitat quality, such as the presence or absence of nectar-producing trees, hollow-bearing trees, a shrubby understorey, the level of disturbance (e.g. as indicated by weed invasion), and ground layer characteristics, including leaf litter, logs, rocks and fallen branches. Other habitat attributes were noted, these include:

- size and shape of patch;
- connectivity (habitat links or corridors);
- presence of specific habitat features (e.g. wetlands, rock outcrops); and
- structural heterogeneity of vegetation.

Habitat types were assessed for their capacity to support indigenous fauna, particularly regarding the habitat requirements of threatened faunal species.

Spotlight survey

Spotlight survey was primarily employed to detect arboreal mammals, such as gliding and non-gliding possums, e.g. Sugar Glider (*Petaurus breviceps*), Feathertail Glider (*Acrobates pygmaeus*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Common Brushtail Possum (*Trichosurus vulpecula*). Spotlighting can also be used to detect nocturnal birds, including owls and nightjars, and small ground-dwelling and scansorial (ground and tree-dwelling) mammals (e.g. marsupial mice from the genus Antechinus).

Spotlighting commenced after dusk, using two 30W spotlights, and was undertaken for approximately two hours over one night. Animals detected in the spotlight beam were identified with the aid of binoculars.

Owl-call playback survey

Owl-call playback was conducted at two sites on one night. Playback surveys were only conducted on calm nights with little or no rain. Wind and rain noise reduce the effectiveness of this survey method (Kavanagh and Peake 1993). All owls and other wildlife seen or heard were recorded. At the completion of playback, a 10 minute spotlighting session was conducted to search for owls which may have flown in undetected and arboreal mammals or other nocturnal wildlife. During this session, the observer walked for about 100m around the general area, listening for fauna and using a hand-held spotlight. All animals seen or heard were recorded. Incidental observations of birds nearby were also recorded.

Diurnal birds – Standardised Search

The 'Standardized Search' method involves taking repeated, consecutive surveys within the target patch, continuing until a stopping rule is satisfied – in this case until fewer than three species were added in two consecutive surveys. This method surveys at the whole of patch scale, and the amount of effort is result-based rather than arbitrarily effort-based (i.e. the survey stops when no further meaningful data is being added). It is highly effective for the purpose of biodiversity inventory. The duration of individual surveys was 10 minutes. Birds were surveyed at Pinkerton Forest and Bush's Paddock between 4-6 December 2006 by the 'Standardized Search' methodology (Watson 2003); with approximately equal effort being distributed in the two patches.

Other incidental or indirect methods were used to detect birds. Most important of these was the detection and identification of nests, excreta (whitewash) and prey remains used for detecting owls and raptors. Birds heard or seen during nocturnal work, or outside formal bird survey periods, were also recorded.

Reptile and Amphibian survey

Active daytime searches were conducted for reptiles and frogs during the habitat assessment and diurnal bird surveys. This involved searching among fallen clumps of bark and litter, overturning rocks, logs, fallen branches and human-generated debris and searching on bare ground surfaces for

reptiles and frogs moving during normal activities, or sheltering. Frog searches were also conducted at night using spotlights and listening for calls.

Electronic bat detection

An Anabat II electronic bat detector was deployed to remotely survey microchiropteran bat species. The Anabat II detector (Titley Electronics, Ballina, NSW) senses bat ultrasound and dumps it on to a Compact Flash (CF) card via a digital delay unit (CF Z-CAIM; Titley Electronics). The distinctive call signatures of bats can then be identified by subsequent zero-crossings analysis on a personal computer using the Anabat VI or Analook software (Chris Corben and Titley Electronics). Species recorded on the CF card were then identified by Lawrie Conole (Ecology Australia Pty Ltd), with reference to call libraries as appropriate.

Invertebrates

A full invertebrate survey was not commissioned as part of this study, but incidental records of invertebrates (particularly large insects such as butterflies and ants) were collected during daylight active searches. Some targeted searching for nests of the bulldog ant (*Myrmecia* sp. 17 or *Myrmecia* sp. aff. *nigriceps*) was conducted. Weather conditions in the latter part of the survey were not suitable for survey of the Golden Sun Moth (*Synemon plana*), and no targeted surveys for this species were conducted.

Active searches

All vertebrates seen or heard calling were recorded, as well as indirect evidence of vertebrates such as scats (droppings) or tracks. Active searches were carried out whenever observers were in the field.

Analysis of BOCA bird survey data

Bird survey data collected by BOCA and provided in raw form by Dave Torr was analysed to gauge the relative abundance of woodland bird species in the study area over recent years, and to evaluate current survey timing and methodology being deployed by BOCA.

3.2.3 Limitations

Flora

As for all flora surveys, the seasonality of some plant species may be a limitation. Some species may have been overlooked because they were inconspicuous in the extreme drought conditions that prevailed, when the survey was conducted, or have been identified to genus level only due to the absence of fertile material. For instance it was not possible to make an adequate distinction between the State-significance indigenous branched Heath Spear-grass (*Austrostipa exilis*) and exotic branched Cane Needle-grass (**Nassella hyalina*) due to the absence of fertile material.

Therefore '*Austrostipa sp.*' has been used within the text and data set. Flowering and/or fruiting was severely restricted in many species, and some have undoubtedly been overlooked.

These limitations are unlikely to alter the findings regarding overall quality and conservation significance of the vegetation.

Fauna

The survey was carried out over a relatively brief time-frame; therefore not all fauna species that utilise the study area would have been recorded. In particular, the cryptic and rare species that are often the focus of threatened species legislation cannot always be expected to be detected. Other species would not have been recorded due to the seasonality of their occurrence in the study area (e.g. some nomadic or migratory bird species). This limitation is overcome to some extent through the information on species recorded from the DRA, sourced from the AVW database (DSE 2004).

3.2.4 Terminology and taxonomy

An asterisk (*) preceding the plant or animal name is used to signify non-indigenous taxa, which are those that would not naturally occur in the particular habitat. A hash (#) is used to denote native plant species that are not necessarily indigenous in the relevant vegetation types or region.

Plant taxonomy and the use of common names follow Ross and Walsh (2003) and DSE (2004b) respectively. Several informal names (Ecology Australia, unpub.) are also used for taxa that are not currently recognised in the literature, e.g. *Enchylaena tomentosa* (prostrate form). The scientific names, common names and systematic orders of vertebrates follow Christidis and Boles (1994) and Schodde and Mason (1999) for birds, and the 'Atlas of Victorian Wildlife' for all other taxa.

In utilising previous records from Frood et al. (2003) and other raw data provided from the Pinkerton Landcare and Environment Group, some names have been altered to reflect nomenclatural changes, for instance, *Bracteantha viscosa* is now known as *Xerochrysum viscosum* and *Agrostis avenacea* is now known as *Lachnagrostis filiformis*; in other cases we have amended the record to reflect more accurate taxonomic information, for instance, *Eucalyptus baueriana* in the study area is more correctly called *Eucalyptus* aff. *baueriana* (Werribee River Catchment) and *Dianella longifolia* records are most likely *Dianella* sp. aff. *longifolia* (Benambra). In the latter cases, this has given these species a higher level of conservation significance.

3.2.5 Determination of significance

Categories of significance used in this report and how they are determined are explained in Appendix 7.

4 Values

4.1 Flora

4.1.1 Plant taxa

A total of 143 plant species was recorded at both sites (135 species were recorded at Bush's Paddock and 48 were recorded at Pinkerton Forest). Eighty-two of these (57%) were indigenous (Appendix 1 and 2). One species, Clover Glycine (*Glycine latrobeana*), listed under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and Victorian *Flora and Fauna Guarantee Act 1988* was recorded at Pinkerton Forest. A further five species of State significance (listed by DSE 2005a) were also recorded (see Table 1) (Figure 2). One of these species, Werribee Blue Box (*Eucalyptus* aff. *baueriana* (Werribee River Catchment)) is a local endemic which will soon be described as *Eucalyptus baueriana* subsp. *thalacina* (K. Rule pers. comm.). Its conservation status is endangered in Victoria and Australia.

Table 1: Threatened plants recorded in the Data Review Area, indicating their conservation status and whether they have been recorded or potentially occur at either Bush's Paddock or Pinkerton Forest. For additional information those species recorded at Eynesbury have also been indicated.

Scientific Name	Common Name	Conservation Status				Recorded or Potentially occurring at:		Recorded at:
		EPBC status	FFG status	VROT status	Regional status	Bush's Paddock	Pinkerton Forest	Eynesbury
Acacia verniciflua (Bacchus Marsh variant)	Bacchus Marsh Varnish Wattle			vulnerable	endangered			✓
Allocasuarina luehmannii	Buloke		Listed		endangered			✓
Alternanthera sp. 1 (plains)	Plains Joyweed			insufficiently known	endangered			✓
Amphibromus fluitans	River Swamp Wallaby-grass	Vulnerable			endangered			✓
Amyema linophylla subsp. *orientale*	Buloke Mistletoe			vulnerable	endangered			✓
Austrostipa exilis	Heath Spear-grass			rare	?endangered			✓
Austrostipa hemipogon	Half-bearded Spear-grass			rare	?	✓	✓	✓
Convolvulus angustissimus subsp. *omnigracilis*	Slender Bindweed			insufficiently known	insufficiently known	✓		
Cullen parvum	Small Scurf-pea	De-listed	Listed	endangered	endangered			✓
Desmodium varians	Slender Tick-trefoil			insufficiently known	endangered	Potential		✓
Dianella sp. aff. *longifolia* (Benambra)	Arching Flax-lily			vulnerable	endangered	✓	✓	✓
Diuris sp. aff. *chryseopsis* (Basalt Plains)	Small Golden Moths	Endangered	Listed	vulnerable	endangered	Potential		

Scientific Name	Common Name	Conservation Status				Recorded or Potentially occurring at:		Recorded at:
		EPBC status	FFG status	VROT status	Regional status	Bush's Paddock	Pinkerton Forest	Eynesbury
Eleocharis macbarronnii	Grey Spike-sedge			insufficiently known	endangered			✓
Eucalyptus aff. *baueriana* (Werribee River Catchment)	Werribee Blue Box			endangered	endangered		✓	✓
Glossostigma drummondii	Desert Mud-mat			insufficiently known	endangered			✓
Glycine latrobeana	Clover Glycine	Vulnerable	Listed	vulnerable	endangered	Potential	✓	✓
Gratiola pumilio	Dwarf Brooklime			rare	endangered			✓
Nicotiana suaveolens	Austral Tobacco			rare	endangered			✓
Poa labillardieri (Volcanic Plains)	Basalt Tussock-grass			insufficiently known	insufficiently known	Potential		✓
Rhagodia parabolica	Fragrant Saltbush			rare	rare	✓	✓	✓
Sclerolaena muricata var. *muricata*	Black Roly-poly			insufficiently known	insufficiently known	Potential	Potential	

4.1.2 Ecological Vegetation Classes

Bush's Paddock contains four ecological vegetation classes: Plains Woodland, Plains Grassy Woodland, Low-rainfall Plains Grassland and Wetland Formation. Pinkerton Forest contains Plains Woodland only (Figure 2).

Plains Woodland (EVC 803)

Plains Woodland is characterised by Grey Box (*Eucalyptus microcarpa*) over a grassy and herbaceous ground layer. This community was extensive across the Northern Plains of Victoria with isolated occurrences in the rainshadow areas south of the Great Dividing Range (Oates and Taranto 2001). The community is endangered in the Victorian Volcanic Plain bioregion.

Plains Woodland at Bush's Paddock and Pinkerton Forest is dominated by Grey Box (*Eucalyptus microcarpa*) (Plates 1 and 2). Other eucalypts recorded included Yellow Box (*Eucalyptus melliodora*) at both remnants, and Werribee Blue Box (*Eucalyptus* aff. *baueriana* (Werribee River Catchment)) at Pinkerton Forest where a hybrid between Yellow Box and Werribee Blue Box was also recorded (Plates 3 and 4).

The understorey of both remnants contained few shrub species with very low cover. The most common species at both remnants were chenopods including Fragrant Saltbush (*Rhagodia parabolica*), Berry Saltbush (*Atriplex semibaccata*), Nodding Saltbush (*Einadia nutans*) and Ruby Saltbush (*Enchylaena tomentosa*). Other shrub species recorded at both sites included Golden Wattle (*Acacia pycnantha*), Tree Violet (*Melicytus dentatus s.s.*), Sweet Bursaria (*Bursaria spinosa*) and Gold-dust Wattle (*Acacia acinacea*). A few individuals of Lightwood (*Acacia implexa*), Drooping Sheoak (*Allocasuarina verticillata*) and Turkey-bush (*Eremophila deserti*) were only recorded at Bush's Paddock, and Seaberry Saltbush (*Rhagodia candolleana*) was only recorded at Pinkerton Forest. The paucity of shrubs is common to most bioregional remnants of this community, although it is thought that this community may have been shrubby in character prior to European settlement (Oates and Taranto 2001) (Plate 5).

In addition to chenopod shrubs, the ground layer was dominated by grasses, particularly Spear Grasses (*Austrostipa* spp.) and Wallaby Grasses (*Austrodanthonia* spp.).

Figure 2: Location of habitat zones and significant flora species recorded at Pinkerton Forest and Bush's Paddock

Plate 1: Plains Woodland at Bush's Paddock, Mt Cottrell (November 2006)

Plate 2: Plains Woodland at Pinkerton Forest, Mt Cottrell (November 2006)

Plate 3: Werribee Blue Box (*Eucalyptus* aff. *baueriana* (Werribee River Catchment)) at Pinkerton Forest, Mt Cottrell (November 2006)

Plate 4: Hybrid between Yellow Box (*Eucalyptus melliodora*) and Werribee Blue Box (*Eucalyptus* aff. *baueriana* (Werribee River Catchment)) at Pinkerton Forest, Mt Cottrell (November 2006)

Plate 5: Very old Sweet Bursaria (*Bursaria spinosa* subsp. *spinosa*) at Pinkerton Forest, Mt Cottrell (November 2006)

Plains Grassy Woodland (EVC 55_61)

Plains Grassy Woodland occupies poorly drained, fertile soils on flat or gently undulating plains at low elevations. Its dominant species is River Red Gum (*Eucalyptus camaldulensis*). Plains Grassy Woodland is endangered in the Victorian Volcanic Plain bioregion.

There is a small patch of Plains Grassy Woodland, characterised by a stand of River Red Gums situated along an indistinct drainage line within the Plains Woodland in Bush's Paddock (Plate 6). Like the Plains Woodland, the Plains Grassy Woodland contained few shrubs only Tangled Shrub-violet (*Melicytus sp. aff. dentatus* (Volcanic Plains variant) and Tree Violet (*Melicytus dentatus s.s.*). The understorey had a very high cover of Great Brome (**Bromus diandrus*) and Annual Veldt-grass (**Ehrharta longiflora*) which died in the drought conditions before reproducing (flowering or fruiting).

Plate 6: Plains Grassy Woodland at Bush's Paddock, Mt Cottrell (November 2006)

Low-rainfall Plains Grassland (EVC 132_63)

Low-rainfall grassland occupies basalt soils in areas receiving less than 500 mm annual rainfall. Plains Grassland was once common throughout Victoria but today very little remains, and most is degraded due to grazing, cropping, weed invasion and feral animals (particularly rabbits). Plains Grassland is endangered in the Victorian Volcanic Plain bioregion.

There are two patches of Low-rainfall Plains Grassland within Bush's Paddock. The largest patch occupies over half of the property and abuts its eastern and northern boundaries. The other patch is located in the north-western corner of the property.

The largest patch of Plains Grassland is in relatively good condition (Plate 7). It is dominated by indigenous grasses, particularly Kangaroo Grass (*Themeda triandra*) and Kneed Spear-grass (*Austrostipa bigeniculata*). Other common species include Slender Bindweed (*Convolvulus angustissimus* subsp. *omnigracilis*), Blue Devil (*Eryngium ovinum*), Wingless Bluebush (*Maireana enchylaenoides*) and Arching Flax-lily (*Dianella* sp. aff. *longifolia* (Benambra). Common weeds included Common Onion Grass (**Romulea rosea* var. *australis*), Serrated Tussock (**Nassella trichotoma*), Bearded Oat (**Avena barbata*), Wimmera Rye-grass (**Lolium rigidum*), Fescue (**Vulpia sp.*) Common Sow-thistle (**Sonchus oleraceus*) and Cape Weed (**Arctotheca calendula*).

Plate 7: Unburnt *Themeda* dominated Low-rainfall Plains Grassland at Bush's Paddock, Mt Cottrell (November 2006)

Part of this largest patch of grassland, situated closer to the woodland, had been burnt in the Summer of 2005-06 to reduce biomass and stimulate responses in the indigenous plant species, particularly flowering, fruiting and recruitment (Plate 8). This is a highly desirable or essential management activity as episodic fire is a natural phenomenon to which the flora is attuned. The extreme drought conditions that prevail resulted in a sub-optimal response in the flora, with very little flowering or fruiting and premature senescence and/or dormancy. Even so, many species flowered in the burnt section that did not flower in the unburnt section, for example scores of Feather Heads (*Ptilotus macrocephalus*) flowered and hopefully will fruit (Plate 9). Another positive response in the vegetation resulting from fire was that the cover of weeds was much less that in the unburnt grassland.

Plate 8: Burnt *Themeda* dominated Low-rainfall Plains Grassland at Bush's Paddock, Mt Cottrell with a sprayed Serrated Tussock (**Nassella trichotoma*) shown in front of the rock near in the mid-ground (November 2006)

Plate 9: Feather Heads (*Ptilotus macrocephalus*) flowering in the burnt *Themeda* dominated Low-rainfall Plains Grassland at Bush's Paddock, Mt Cottrell (November 2006)

The smaller patch of Plains Grassland was far less diverse. It was dominated by Spear-grass (*Austrostipa spp.*), Wallaby-grasses (*Austrodanthonia* spp.) and Windmill Grass (*Chloris truncata*) rather than Kangaroo Grass (Plate 10). There were few other species except exotic annuals such as Soft Brome (**Bromus hordaceus*) and Bearded Oat (**Avena barbata*). This grassland is highly modified and of a much lower quality than the larger grassland along Mt Cottrell Road. The Pinkerton Landcare and Environment Group has advised that this is due to a previous history of cultivation and that some of the Wallaby-grasses and Windmill Grasss have been directly seeded into this section by the Group.

Plate 10: *Austrostipa-Austrodanthonia* dominated Low-rainfall Plains Grassland at Bush's Paddock, Mt Cottrell (November 2006)

The Plains Grassland in the elevated part of Bush's Paddock dominated by Kangaroo Grass (*Themeda triandra*) but essentially without trees is to all purposes natural as it has the same floristic composition as genuinely treeless grassland of the Volcanic Plains. We have reason to believe however that it is to some extent an artefact of clearing, and that it would formerly have been a grassy understorey in woodland. This would have been dominated by Grey Box (*Eucalyptus microcarpa*) and almost certainly Drooping Sheoak (*Allocasuarina verticillata*). Revegetation with woody plants is not advocated because an overstorey may now adversely compete with the herbaceous plants; treeless grassland is now extremely rare and numerous rare and threatened plant species occur in Bush's Paddock grassland.

Wetland formation

A small farm dam is located in the north-western part of Bush's Paddock but was dry at the time field work was carried out (Plate 11). The suite of aquatic and amphibious indigenous plant species persisting or evident indicated a well-developed wetland vegetation in the dam. Species included three species of Pondweed (*Potamogeton cheesmanii*, *Potamogeton pectinatus* and *Potamogeton ochreatus*) (two of which are obligate aquatics), Cumbungi (*Typha domingensis*), Common Spike-sedge (*Eleocharis acuta*), Swamp Crassula (*Cerassula helmsii*) and Common Blown-grass (*Lachnagrostis filiformis*). Most of the wetland species occur nowhere else in Bush's Paddock or Pinkerton Forest and to what extent the wetland vegetation will recover after drought remains to be seen.

Because this wetland vegetation is an artefact, i.e. developed as a constructed wetland in a former woodland it is classified as Wetland Formation, and not according to the Wetland EVC typology developed by DSE (2006a).

Plate 11: Wetland Formation at Bush's Paddock, Mt Cottrell (November 2006)

4.2 Habitat condition assessment and Net Gain implications

Pinkerton Forest contains one ecological vegetation class, Plains Woodland, which is all considered one habitat zone. Bush's Paddock contained three ecological vegetation classes: Low-rainfall Plains Grassland, Plains Woodland, Plains Grassy Woodland and Wetland Formation and five habitat zones – the Plains Woodland and Plains Grassy Woodland each forms one zone and the Low-rainfall Plains Grassland has been divided into three zones – the unburnt patch adjoining Mt Cottrell Road; the burnt patch to the east of the woodland; and the species-poor patch in the north-western corner of the site (see Figure 2).

Habitat hectare assessment according to benchmark conditions (see Section 3.2.1) indicates that the Plains Woodland at both sites are of similarly high quality (Pinkerton Forest: 60% of pre-European condition, Bush's Paddock: 61% of pre-European condition) and very high conservation significance. The Plains Grassy Woodland at Bush's Paddock is of low to moderate quality (31% of pre-European condition) (Table 2).

Table 2: Habitat Condition scores for the woodland habitat zones at Pinkerton Forest and Bush's Paddock

Site			Pinkerton Forest	Bush's Paddock	Bush's Paddock
Habitat Zone			1	1	2
EVC Name (Initials)			Plains Woodland	Plains Woodland	Plains Grassy Woodland
EVC Number			803	803	55_61
		Max Score	Score	Score	Score
Site Condition	Large Old Trees	10	8	4	0
	Canopy Cover	5	5	5	2
	Understorey	25	15	20	5
	Lack of Weeds	15	9	9	4
	Recruitment	10	3	6	3
	Organic Matter	5	3	5	5
	Logs	5	5	0	0
	Total Site Score	**75**	**48**	**49**	**19**
Landscape value	Patch Size	10	8	8	8
	Neighbourhood	10	3	3	3
	Distance to core	5	1	1	1
Habitat Score		**100**	**60**	**61**	**31**
Habitat Score		1	0.6	0.61	0.31
Habitat Zone area (ha)		(#.#)	59.6	13.5	0.2
Habitat hectares		(#.#)	**0**	**8.235**	**0.062**
Bioregion			VVP	VVP	VVP
EVC Conservation Status			E	E	E
Number of Large Old Trees					

The patches of *Themeda* grassland, both burnt and unburnt, closer to Mt Cottrell Road at Bush's Paddock were of similarly high quality (unburnt patch 56% of pre-European condition, the burnt patch 58% of pre-European condition). However, the *Austrodanthonia-Austrostipa* grassland in the north-western corner of Bush's Paddock was only of moderate quality (39% of pre-European condition) (Table 3). The *Themeda* grassland (both unburnt and burnt parts) is of very high conservation significance and the *Austrodanthonia-Austrostipa* grassland is of high conservation significance.

Table 3: Habitat Condition scores for the grassland habitat zones at Bush's Paddock

Site			Bush's Paddock	Bush's Paddock	Bush's Paddock
Habitat Zone			3 - burnt *Themeda*	4 - unburnt *Themeda*	5 - *Austrostipa*
EVC Name (Initials)			Low rainfall Plains Grassland	Low rainfall Plains Grassland	Low rainfall Plains Grassland
EVC Number			132_65	132_65	132_65
		Max Score	Score	Score	Score
Site Condition	Large Old Trees	10	NA	NA	NA
	Canopy Cover	5	NA	NA	NA
	Understorey	25	15	20	5
	Lack of Weeds	15	13	7	6
	Recruitment	10	6	0	6
	Organic Matter	5	0	5	3
	Logs	5	NA	NA	NA
	Total Site Score	**75**	34	32	20
	Multiplier*		75/55	75/55	75/55
	Adjusted Site Score	**75**	**46.4**	**43.6**	**27.3**
Landscape value	Patch Size	10	8	8	8
	Neighbourhood	10	3	3	3
	Distance to core	5	1	1	1
Habitat Score		**100**	**58.4**	**55.6**	**39.3**
Habitat Score		1	0.58	0.56	0.39
Habitat Zone area (ha)		(#.#)	8.3	12.4	11.2
Habitat hectares		(#.#)	**4.8**	**6.9**	**4.4**
Bioregion			VVP	VVP	VVP
EVC Conservation Status			E	E	E

*For non-forest or woodland vegetation types where some elements of the score are not relevant.

In order to assess the suitability of Bush's Paddock and Pinkerton Forest as BushBroker sites, the potential gains in native vegetation quality and quantity from improved protection and management was calculated. Gain scoring is based on the potential improvement in vegetation quality based on current vegetation quality and land manager commitments. Land managers would be required to commit to a 10-year management program. If the sites were used to offset permitted clearing at another site then landholder commitments would be required in perpetuity to quality as an offset gain. An offset plan would also be required.

As Bush's Paddock is public land managed by Shire of Melton; and Pinkerton Forest is managed by Western Water, a State Government Business Entity and zoned Public Use Zone; both sites are ineligible for maintenance or prior-management gains (DSE 2006b). If the sites were transferred into formal reserves then they may be eligible for security gains. Otherwise both sites are only eligible for improvement gains.

Improvement gains at Bush's Paddock and Pinkerton Forest have been calculated based on the following commitments:

- Control *all* high threats including on site grazing threats (e.g. stock, rabbits, other pest herbivores etc.), high threat weeds, inappropriate fire regimes etc.;
- Eliminate all high threat environmental weeds (<1% cover) and ensure that weed cover does not increase beyond the current level; and
- In grasslands, ensure that total vegetation cover does not fall below 70%.

The potential gain for Bush's Paddock, if it was used as an offset site is c. 3.5 habitat hectares. The gain for each habitat zone in given in Table 4. The potential gain for Pinkerton Forest, if it was used as an offset site is c. 5.3 habitat hectares.

It should be noted that the net gain multiplier was left at 1. If the site was used as an offset for vegetation clearing at another site then the multiplier may increase to 1.5 or 2, if the conservation significance of the vegetation at the other site is lower.

Table 4: Potential gains for all habitat zones at Pinkerton Forest and Bush's Paddock if they were to be used as offset sites

Offset Identifier			Offset HZ1 PK			Offset HZ1 BP			Offset HZ2 BP			Offset HZ3 BP			Offset HZ4 BP			Offset HZ5 BP		
EVC Name (Initials)			Plains Woodland			Plains Woodland			Plains Grassy WL			Plains Grassland			Plains Grassland			Plains Grassland		
EVC Number			803			803			55_61			132_65			132_65			132_65		
Current Score and Conservation significance			Endangered			Endangered			Endangered			Endangered			Endangered			Endangered		
		Max Score	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement	Current Score	Maintenance	Improvement
Site Condition	Large Old Trees	10	8	0		4	0		0	0		NA	0		NA	0		NA	0	
	Canopy Cover	5	5	0	0	5	0	0.4	2	0	0.4	NA	0	0	NA	0	0	NA	0	0
	Understorey	25	15	0	5	20	0	5	5	0	2.5	15	0	2.5	20	0	2.5	5	0	0.63
	Lack of Weeds	15	9		4	9		4	4		2	13		2	7		2	6		1
	Recruitment	10	3	0	4	6	0	4	3	0	2	6	0	1.5	0	0	0	6	0	1.5
	Organic Matter	5	3	0	2	5	0	0	5	0	0	0	0	0	5	0	1	3	0	1
	Logs	5	5	0	NA	0	0	0	0	0	0	NA	0	0	NA	0	0	NA	0	0
Habitat gain		##		0	15		0	13		0	6.9		0	6		0	5.5		0	4.13
Gain (Improvement + management)			15			13.4			6.9			6			5.5			4.13		
Improved Security Gain		##	0			0			0			0			0			0		
Prior management		##	0			0			0			0			0			0		
Total Gain in Habitat Score / ha		##	15			13.4			6.9			6			5.5			4.13		
Total Gain in Habitat Score / ha (/100)		**0.##**	**0.15**			**0.13**			**0.07**			**0.06**			**0.06**			**0.04**		
Area of the proposed offset		#.#	35			13.5			0.2			8.3			12.4			11.2		
Net Gain (hha)		#.#	5.25			1.81			0.01			0.50			0.68			0.46		
Net Gain Multiplier			1			1			1			1			1			1		
Contribution (hha) to Net Gain Target		**#.#**	**5.25**			**1.81**			**0.01**			**0.50**			**0.68**			**0.46**		

4.3 Fauna

4.3.1 Fauna habitats

Fauna habitat within the study area is comprised of open woodland, dominated by Grey Box (*Eucalyptus microcarpa*) and grassland communities.

Pinkerton Forest

Pinkerton Forest supports scattered old-growth trees with important habitat attributes such as hollows and stags (dead-standing trees) (Plate 12). These characteristics provide den sites for possums and bats, and nest sites for owls, parrots and cockatoos. The canopy layer supports nesting resources for bird species including Australian Magpie, Jacky Winter, thornbills and honeyeaters. Two fledgling Wedge-tailed Eagles were observed in a large nest, high in the canopy (Plates 14 and 15).

The understorey is dominated by an open grassy layer, interspersed with bare ground, dense leaf litter, logs and surface rock (Plate 13). These ground-layer features provide good habitat for invertebrates (e.g. ants); herpetofauna (reptiles and frogs); potential habitat for ground-dwelling birds, such as Stubble Quail; and logs provide good habitat for the threatened Brown Treecreeper.

The current levels of logs on the ground ('coarse woody debris' in ecological parlance) constitute important habitat for a range of bird, reptile and invertebrate species. Though some of these logs also constitute rabbit harbour, their maintenance is a high conservation priority.

Plate 12: Coarse woody debris, Pinkerton Forest, Mt Cottrell (December 2006)

Bush's Paddock

Bush's Paddock supports a higher density of trees, but with little or no old-growth features. The canopy layer provides nesting resources for birds, such as Rufous Whistler. The grassland community within Bush's Paddock is dominated by Kangaroo Grass *(Themeda triandra*), to the east, and *Austrodanthonia* spp. and *Austrostipa* spp. to the west. Grassland habitat is likely to provide habitat for reptiles, and supports potential habitat for two EPBC-listed species: the Plains Wanderer and Golden Sun Moth (see Section 1.3). Rock piles and dense leaf litter (Plate 13), provide potential habitat for reptiles, such as the South-eastern Slider (previously recorded at Bush's Paddock) and other skinks and lizards.

The shrub layer in both sites is very sparse and mid-storey cover is essentially non-existent. Exotic species such as Boxthorn, is scattered across the sites and provides shelter and nesting resources for Zebra Finch, Superb Fairy-wren and the FFG-listed Diamond Firetail. Re-introduction of a shrub layer into both sites would greatly enhance the current fauna habitat values (see Section 6.6).

As the trees in Bush's Paddock are much younger than those in Pinkerton Forest, the development of hollows, dead stags and fallen logs is at a very early stage in Bush's Paddock. The fauna would benefit from the supplementation of fallen logs in Bush's Paddock (from outside sources).

Plate 13: Bush's Paddock, showing young Grey Box trees typical of the patch and ground-layer cover, Mt Cottrell (December 2006).

Landscape Context

Pinkerton Forest and Bush's Paddock are separated by farmland and both are fenced, with a rabbit proof fence around Pinkerton Forest. Both sites adjoin Surbiton Park which contain treatment wetlands and open grassy areas. The study area lies within a farmland matrix with scattered trees

along roadsides providing limited connectivity to other remnant vegetation. Movement of ground-dwelling fauna, such as Echidnas in Pinkerton Forest is possibly impeded by rabbit proof fencing, open farmland (limited cover) may limit ground-dwelling bird species such as Stubble Quail and roads generally may impede fauna movement (e.g. due to low cover and higher risk of mortality). Provision of connecting habitat between Bush's Paddock and Pinkerton Forest would enhance potential fauna movement between these two patches.

Approximately 3 km to the south-west is Eynesbury Forest which is also a Grey Box Woodland community. Other remnant patches of vegetation in the surrounding landscape include several stands of River Red Gum between the study area and Melton Township, and Long Forest (mallee, Grey Box, other woodland communities) c. 12 km to the north-west. Larger forest and woodland blocks in the wider landscape include the Brisbane Ranges c. 25 km to the west, the Pyrites Range c. 18km to the NNW and the You Yangs c. 22km to the SW.

In a landscape ecology context it is clear that, particularly for birds, the Eynesbury, Pinkerton and Bush's Paddock patches function as a single system – each one important for ongoing ecological function in the others. From the analysis of bird surveys conducted since 2004, one can see that a number of the woodland bird species which are infrequently but regularly recorded from Pinkerton or Bush's Paddock (eg. Grey Shrike-thrush, Restless Flycatcher, Varied Sittella) are likely to be coming from a source population in the surrounding landscape, which can only be Eynesbury. The likelihood that species such as the Restless Flycatcher or Varied Sittella could regularly come overland from somewhere like the Brisbane Ranges (25km), Pyrites Range (18km) or Long Forest (12km) is extremely low, and quite improbable.

Further to the Eynesbury – Pinkerton and Bush's Paddock system, there are two other small woodland patches in close proximity which may contribute to the system, these are the Exford and Strathtulloh woodlands. The Exford woodlands are located to the nort-west in Exford, and the Strathtulloh woodlands are located along Toolern Creek also to the north-west. These patches, while small, are likely to support habitat for some woodland bird species and according to PLEG are also in need of restoration.

The significance of either Pinkerton Forest or Bush's Paddock would be diminished if the connection with Eynesbury was lost or impeded. Maintaining and enhancing the links between these patches and other smaller patches to the north-west should be high priorities for future management actions.

4.3.2 Fauna species

A total of 65 fauna species was recorded during the field survey, including 44 bird species (five exotic, 11 mammal species (three exotic), one reptile species, two frog species and seven invertebrate species (one exotic) (Table 5).

Table 5: Bird species recorded at Bush's Paddock and Pinkerton Forest December 2006, Mt Cottrell.

Number columns show 'reporting rate' – an incidence measure based on frequency = % of surveys in which the species was recorded.

+ = present, no abundance measure.

* = feral/introduced species.

§ = evidence of local breeding recorded during the study.

Rows highlighted in red show threatened species; rows highlighted in yellow show species recorded offsite but in close proximity.

Common name	Scientific name	Bush's Paddock	Pinkerton Forest	Total
Whistling Kite	*Haliastur sphenurus*		16.7	9.1
§Brown Goshawk	*Accipiter fasciatus*	20	16.7	18.2
§Wedge-tailed Eagle	*Aquila audax*		33.3	18.2
Crested Pigeon	*Ocyphaps lophotes*		16.7	9.1
Galah	*Cacatua roseicapilla*	40	66.7	54.5
Long-billed Corella	*Cacatua tenuirostris*		33.3	18.2
Sulphur-crested Cockatoo	*Cacatua galerita*		33.3	18.2
Crimson Rosella	*Platycercus elegans*	20		9.1
Eastern Rosella	*Platycercus eximius*	20	66.7	45.5
Red-rumped Parrot	*Psephotus haematonotus*		83.3	45.5
Southern Boobook	*Ninox boobook*		16.7	9.1
Barn Owl	*Tyto alba*		16.7	9.1
Laughing Kookaburra	*Dacelo novaeguineae*		16.7	9.1
Sacred Kingfisher	*Todiramphus sanctus*	40		18.2
Brown Treecreeper	*Climacteris picumnus*		66.7	36.4
Superb Fairy-wren	*Malurus cyaneus*	60	50	54.5
Striated Pardalote	*Pardalotus striatus*	60	33.3	45.5
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	40	16.7	27.3
Yellow Thornbill	*Acanthiza nana*		16.7	9.1
Southern Whiteface	*Aphelocephala leucopsis*		16.7	9.1
White-plumed Honeyeater	*Lichenostomus penicillatus*	80	83.3	81.8
Brown-headed Honeyeater	*Melithreptus brevirostris*		33.3	18.2
§Jacky Winter	*Microeca fascinans*	60	83.3	72.7
Eastern Shrike-tit	*Falcunculus frontatus*	40		18.2
Rufous Whistler	*Pachycephala rufiventris*	80		36.4
Magpie-lark	*Grallina cyanoleuca*		16.7	9.1
Willie Wagtail	*Rhipidura leucophrys*	40	16.7	27.3
Grey Fantail	*Rhipidura albiscapa*	20		9.1
Dusky Woodswallow	*Artamus cyanopterus*	60		27.3
Australian Magpie	*Gymnorhina tibicen*	80	83.3	81.8
Little Raven	*Corvus mellori*	20	33.3	27.3
Singing Bushlark	*Mirafra javanica*	20		9.1
*Skylark	*Alauda arvensis*	20		9.1
Australian Pipit	*Anthus australis*	20		9.1
§*House Sparrow	*Passer domesticus*	80	50	63.6
Diamond Firetail	*Stagonopleura guttata*	40	33.3	36.4
§Zebra Finch	*Taeniopygia guttata*	20	33.3	27.3
*European Greenfinch	*Carduelis chloris*		16.7	9.1
*European Goldfinch	*Carduelis carduelis*	20		9.1
Welcome Swallow	*Hirundo neoxena*		16.7	9.1
§Tree Martin	*Petrochelidon nigricans*	40	66.7	54.5

Common name	Scientific name	Bush's Paddock	Pinkerton Forest	Total
*Common Blackbird	*Turdus merula*	20		9.1
*Common Myna	*Acridotheres tristis*		33.3	18.2
§*Common Starling	*Sturnus vulgaris*	40	83.3	63.6

Table 6: Other fauna species recorded at Bush's Paddock and Pinkerton Forest December 2006, Mt Cottrell.

Common name	Scientific name	Bush's Paddock	Pinkerton Forest
§Common Brushtail Possum	*Trichosurus vulpecula*	+	+
Eastern Freetail-bat	*Mormopterus* sp. EG/2		+
Gould's Wattled Bat	*Chalinolobus gouldii*		+
Chocolate Wattled Bat	*Chalinolobus morio*		+
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		+
Large Forest Bat	*Vespadelus darlingtoni*		+
Southern Forest Bat	*Vespadelus regulus*		+
Little Forest Bat	*Vespadelus vulturnus*		+
*Fox	*Vulpes vulpes*	+	+
*Brown Hare	*Lepus capensis*	+	
§*Rabbit	*Oryctolagus cuniculus*	+	+
Common Blue-tongue Lizard	*Tiliqua scincoides*		+
Common Eastern Froglet	*Crinia signifera*		+
Spotted Grass Frog	*Limnodynastes tasmaniensis*		+
Common Brown	*Heteronympha merope*	+	+
*Cabbage White	*Pieris rapae*	+	
Bulldog Ant	Myrmecia nigriceps	+	+
Bulldog Ant	*Myrmecia piliventris*		+
Sugar Ant	*Camponotus suffusus*		+
Sugar Ant	*Camponotus gasseni*		+
Meat Ant	*Iridomyrmex purpureus*	+	+

4.3.3 Significant fauna species

A number of threatened species have previously been recorded for the fauna DRA (Table 7). These include:

- three species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Swift Parrot, Growling Grass Frog and Macquarie Perch);
- an additional six species listed under the *Flora and Fauna Guarantee Act 1988* (Bulldog ant *Myrmecia* sp. 17, Hooded Robin, Crested Bellbird, Grey-crowned Babbler, Speckled Warbler and Diamond Firetail) and one community – the 'Victorian Temperate Woodland Bird Community' – which includes many of the abovementioned species;
- a further three species listed as threatened only by DSE (2003) (Black-eared Cuckoo, Brown Treecreeper and Black-chinned Honeyeater); and

- nine species are listed under a National Action Plan (Action Plan for Australian Birds {Garnett and Crowley}: Swift Parrot, Hooded Robin, Brown Treecreeper, Black-chinned Honeyeater, Crested Bellbird, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail and; Action Plan for Australian Frogs {Tyler 1997}: Growling Grass Frog).

The DEH EPBC Act Protected Matters Database Search Tool (2005) highlighted a number of threatened and/or migratory EPBC-listed fauna species as potentially occurring, or for which potentially suitable habitat occurs, in a 5 km radius of the study area, but which have not been recorded in the fauna DRA (AVW, DSE 2004c; Table 7). They include a further nine species listed under the EPBC Act 1999.

The DEH database predicts occurrences based on catchments and Bioclim modelling. Therefore, the predicted occurrences for some species highlighted in the data search extend well beyond their actual range. Additionally, some of these species would either have never occurred, or no longer occur in the region; and these and will not be discussed any further. These species include: Australian Painted Snipe; Regent Honeyeater, Spot-tailed Quoll, Grey-headed Flying-fox; Dwarf Galaxias; Australian Grayling; and Macquarie Perch.

The likelihood of regular occurrence (LRO) of the remaining threatened species is considered here, and is based upon: reporting rates (i.e. number, distribution and age of records) of the species as given in the AVW Records (DSE 2004c) and from other survey data for the study area; their known habitat requirements; the presence of suitable habitat in the study area; and results of the field inspection and literature review (Table 7).

Species listed under the *Environment Protection and Biodiversity Conservation Act* 1999

The **Swift Parrot** (*Lathamus discolour*) has previously been recorded for the Fauna DRA in 1988 east of Butlers Road, it appears to have been recorded at Pinkerton Forest on the AVW (DSE 2004c). This species has also recently been recorded at the Long Forest Reserve in 2001; it is thought that the Swift Parrot uses Long Forest Reserve as a flyway during passage movements (Hewish et al. 2006). Swift Parrots breed in Tasmania and over-winter in south-eastern Australia, and generally feed in winter-flowering eucalypt species (e.g. Red Ironbark and Swamp Gum) on the mainland. The Swift Parrot may occasionally frequent the site, but the LRO is low.

The **Plains-wanderer** (*Pedionomus torquatus*) was not recorded for the Fauna DRA. The species is restricted to open native grasslands where vegetation structure rather than floristic composition is important, and they do not occur in woodlands or treed areas (Marchant and Higgins 1993). Parts of the Bush's Paddock grassland remain potential habitat for the species; it has a low LRO in this area.

The closest and most recent record of the **Growling Grass Frog** (*Litoria raniformis*) for the Fauna DRA is from 1993 at Mount Cottrell Junction: junction of Greigs Road and Mount Cottrell Road, c. 2 km north-east of the study area (AVW, DSE 2004c). This species inhabits semi-permanent to permanent wetlands with extensive cover of emergent, submergent and floating vegetation, and terrestrial fringing vegetation (e.g. grassy tussocks) is important for over-wintering and dispersal. Additionally, the occupation of wetlands by Growling Grass Frogs is tightly linked to the

proximity of surrounding wetlands which are also occupied by the frog (Heard et al. 2004). At the time of the surveys, no surface water was present at either of the sites. The condition of the habitat was very dry and not suitable for Growling Grass Frogs; the species has a low LRO. However, during wetter periods there is a higher potential for the species to occur.

The most recent record of the **Striped Legless Lizard** (*Delma impar*) is from 1990, c. 2.5 km south of Mount Cottrell on the east side of Mount Cottrell Road adjacent to Faulkners Road; other recent records are from Rockbank and Deer Park (Conole 2004; AVW, DSE 2004c). Frood et al. (2003) stated that habitat within Bush's Paddock could support the Striped Legless Lizard. The species was thought to inhabit only native grasslands dominated by species such as *Stipa bigeniculata* (Spear-grass) and *Themeda triandra* (Kangaroo Grass). However, recent surveys have revealed that the species occurs in sites dominated by exotic grasses such as **Phalaris aquatica*, **Nassella* spp. and **Hypochaeris radicata* (Conole 2004, Corrigan et al. 1996, O'Shea 1996, Kukolic et al. 1994, Rauhala et al. 1995, Rauhala 1996, Hadden 1995, Coulson 1990). The presence of a relatively dense and continuous structure, rather than the floristic composition of the grasslands, may be important in influencing the persistence of Striped Legless Lizards (Smith and Robertson 1999). The species also requires shelter such as logs, rocks and ground debris and soil crevices (Cogger 2000). Tiles have been placed in Bush's Paddock by Biosis Pty Ltd. as a survey technique for this species; however, the results of the survey are unknown. The habitat within the study area is suitable; the species has a moderate LRO.

The **Grassland Earless Dragon** (*Tympanocryptis lineata pinguicolla*) was recorded for the EPBC protected matters search. The closest record of the species from the AVW is near the Sunbury area at Holden Flora Reserve, c. 18 km north-east of the study area. This species is a specialist inhabitant of lowland temperate native grassland communities and prefers tussock grasslands with Wallaby-grasses (*Austrodanthonia* spp.); Spear-grasses (*Austrostipa* spp.); and Tussock-grasses (*Poa* spp.). Habitats occupied are generally undisturbed and have an open structure (Robertson and Cooper 2000). The species is often found in earth cracks, at the base of grass tussocks, within arthropod burrows or ground litter (Cogger 2000). As the species is now considered extinct in Victoria, it has a negligible LRO.

There are no records of the **Golden Sun Moth** for the fauna DRA. The Golden Sun Moth is a small-to-medium sized diurnal moth which occurs from southern New South Wales to southern Victoria, and was thought to be restricted to grasslands dominated by Wallaby-grasses (*Austrodanthonia* spp.) and Spear-grasses (*Austrostipa* spp.). It has been suggested that a key requirement for the species is that grasslands support a high cover (i.e. exceeding 40 %) of particular Wallaby-grass species, such as *A. carphoides, A. auriculata, A. setacea and A. eriantha* (ACT 1998, O'Dwyer et al. 2000). However, recent surveys in the Epping and Craigieburn area have recorded the species in grasslands with a low cover of the host grass species, and in heavily grazed areas (C. Renowden, pers. obs.). A recent study has also recorded the species feeding on the exotic Chilean Needle-grass (**Nassella neesiana*) (Brian Bainbridge, pers. com., Merri Creek Management Committee). There are parts of Bush's Paddock grassland that appear to be suitable for the species, particularly in the areas dominated by *Austrostipa* spp. and *Austrodanthonia* spp. which are interspersed with bare ground. Therefore the species has a moderate LRO.

Species listed under the Migratory and/or Marine-Overfly Schedules of the *EPBC Act*

Forty-six bird species occurring in the Fauna DRA (AVW, DSE 2004c), or for which suitable habitat was predicted to occur in a 1.5 km radius of the study area (DEH 2006), are listed under the EPBC Act as Migratory and/or Marine Overfly species. Twenty-two of these species have a moderate or higher LRO in the study area due to the presence of suitable habitat (Table 7).

Eight of these species were recorded during the field surveys: Brown Goshawk, Whistling Kite, Southern Boobook, Sacred Kingfisher, Welcome Swallow, Magpie-lark, Australian Pipit and Little Raven (Table 7).

One species, the Swift Parrot, is listed as threatened under the EPBC Act and FFG Act and also listed under the Migratory and Marine Overfly schedules of the EPBC Act (see above for assessment of LRO).

The remaining migratory species likely to occur are common species in the region and none is regarded as threatened. The study area does not support an ecologically significant population, represent the edge range for a species and does not constitute critical or limiting habitat for those species with a moderate or high LRO (Table 7).

Species listed under the *Flora and Fauna Guarantee Act* 1988

The **Bush Stone-curlew** (*Burhinus grallarius*) was not recorded for the Fauna DRA, and is regionally extinct, with a negligible LRO.

The **Hooded Robin** (*Melanodryas cucullata*) was recorded in 1988 at Eynesbury Reserve, c. 3 km south-west of the study area (AVW, DSE 2004). This species inhabits open woodlands and shrublands dominated by acacias and eucalypts, and prefers areas with dead or fallen timber (Higgins and Peter 2002). The species is also known from mallee scrub, cypress-pine woodlands, mallee heaths with scattered trees, scrubs and box-iron bark forests (Emison et al. 1987, Pizzey and Knight 1997). The species has disappeared from most of its former range and has not been recorded at Long Forest Reserve (c. 12 km to the north-west) in recent years, the species has a low LRO.

Records of the **Crested Bellbird** (*Oreoica gutturalis*) for the Fauna DRA are from Long Forest Reserve, with the most recent record form 2003 (AVW, DSE 2004c; Hewish et al. 2006). The Crested Bellbird occurs in the dry country of central Victoria and habitats include dry acacia shrublands or woodlands, eucalypt woodlands, including mallee and Spinifex; they generally prefer dense vegetation near the ground (Hewish 2006, Higgins and Peter 2002). It is unlikely the species frequents the study area because of unsuitable habitats, combined with the lack of recent records despite extensive surveys of the area; it has a negligible LRO.

The **Grey-crowned Babbler** (*Pomatostomus temporalis*) was last recorded for the Fauna DRA in 1987 near Eynesbury Reserve (AVW, DSE 2004c). However, this species is now considered extinct in the region; therefore it has a negligible LRO.

The most recent records of the **Speckled Warbler** (*Chthonicol sagittata*) are from Long Forest and Eynesbury Reserve. Long Forest Reserve is regarded as the local stronghold for the species and is

one of the few places it can be reliably heard or seen (Hewish et al. 2006). The densities of Speckled Warbler at Eynesbury Reserve are comparable to Long Forest, however the woodland area is smaller than Long Forest and the total number of birds is likely to be much lower (Hewish et al. 2006). The Fauna DRA also shows three historical records of Speckled Warblers in the Pinkerton Forest/Bush's Paddock area from 1988 (AVW, DSE 2004c). The species inhabits a mostly grassy ground layer of dry sclerophyll forests and woodlands often associated with scattered shrubs in the understorey (Higgins and Peter 2002). Under the current conditions of the study area, this species has a low LRO, however, if a shrub-layer was established, the species would have a higher likelihood of occurrence.

The **Diamond Firetail** (*Stagonopleura guttata*) has been consistently recorded at Pinkerton Forest and Bush's Paddock over recent years (current study; Dave Torr, unpub. data. Bird Observers Club of Australia -BOCA; AVW, DSE 2004c). Diamond Firetails are also widespread at Long Forest Reserve, but in low numbers (Hewish et al. 2006). The species inhabits open forests, and other lightly timbered habitats such as farmlands with remnant trees, or grasslands with scattered trees. The species prefers open woodlands dominated by eucalypts such as Red Gum, Yellow Gum, Manna Gum and Grey Box (Higgins and Peter 2002). This species is resident fauna in the study area.

Bulldog Ant (*Myrmecia* sp. 17) was not recorded in either Bush's Paddock or Pinkerton Forest during this study, but the similar and closely related *Myrmecia nigriceps* was.

Other Threatened Fauna

The **Black-eared Cuckoo** (*Chrysococcyx osculans*) was last recorded in the area in 1988 at Eynesbury Reserve (AVW, DSE 2004c). The species generally prefers mainly open vegetation characteristics such as open woodlands and shrublands, particularly dominated by stunted mallee communities (Higgins 1999). The habitat is sub-optimal within the study area and the species may occasionally visit the study area, low LRO.

The **Brown Treecreeper** (*Climacteris picumnus victoriae*) has been consistently recorded in the study area and in the surrounding landscape, such as Eynesbury Station in 2000 and at Long Forest Reserve (current study; AVW, DSE 2004c; David Torr, BOCA). The Brown Treecreeper occurs mostly in woodlands dominated by eucalypts, such as stringybarks and other rough-barked eucalypts with an open grassy understorey, and habitat with stands of dead trees and abundant fallen timber (Higgins et al. 2001). The species was confirmed to be part of the resident fauna at Pinkerton Forest and Bush's Paddock; it has a high LRO.

The **Black-chinned Honeyeater** (*Melithreptus gularis*) was last recorded for the Fauna DRA in 1988 at Eynesbury Forest (AVW, DSE 2004c), and is likely to be found further north at Long Forest Reserve. The species is mostly found in open eucalypt forests or woodlands dominated by box and ironbark species, such as Grey Box, Yellow Box and Yellow Gum (Higgins et al. 2001). However, in the wider Port Phillip area this species is largely confined to Yellow Gum woodland and forest (L.E. Conole, unpubl. data), the therefore habitat within the study area is not suitable. This species has a negligible LRO.

Other notable fauna

A pair of Wedge-tailed Eagles *Aquila audax* nested in Pinkerton Forest in 2006, with their large platform nest built in a tall Grey Box tree (see Plates 14 and 15). During the survey in December 2006 at least one large, almost fledged eaglet was visible in the nest, but there may have been others not visible from the ground. Wedge-tailed Eagle nests within Greater Melbourne are uncommon, and its breeding presence at Pinkerton Forest is of regional significance.

Both the Zebra Finch *Taenopygia guttata* and Southern Whiteface *Aphelocephala leucopsis* are rare in the Greater Melbourne area, but present around the fringes of Pinkerton Forest and Bush's Paddock. The Southern Whiteface is particularly rare now, and the Mt Cottrell-Exford area down to the You Yangs is probably its stronghold in south-central Victoria (L.E. Conole, unpubl. data). Zebra Finches appear to have been nesting in the pendulous foliage of the Werribee Blue Box *Eucalyptus* aff. *baueriana* (Werribee River Catchment)) tree, as well as in Tree Violets and boxthorn in the fencelines (see Plate 16). Their presence at Pinkerton Forest and Bush's Paddock is of regional significance.

The large bulldog ant *Myrmecia nigriceps* occurs more commonly in northern Victoria, but is known from other sites on or near the eastern part of the Victorian Volcanic Plain such as Long Forest and Bannockburn. Its presence at Pinkerton Forest and Bush's Paddock is of regional significance.

Plate 14: Wedge-tailed Eagle nest in Grey Box tree, Pinkerton Forest, Mt Cottrell (December 2006)

Plate 15: Single eaglet visible in nest, Pinkerton Forest, Mt Cottrell (December 2006)

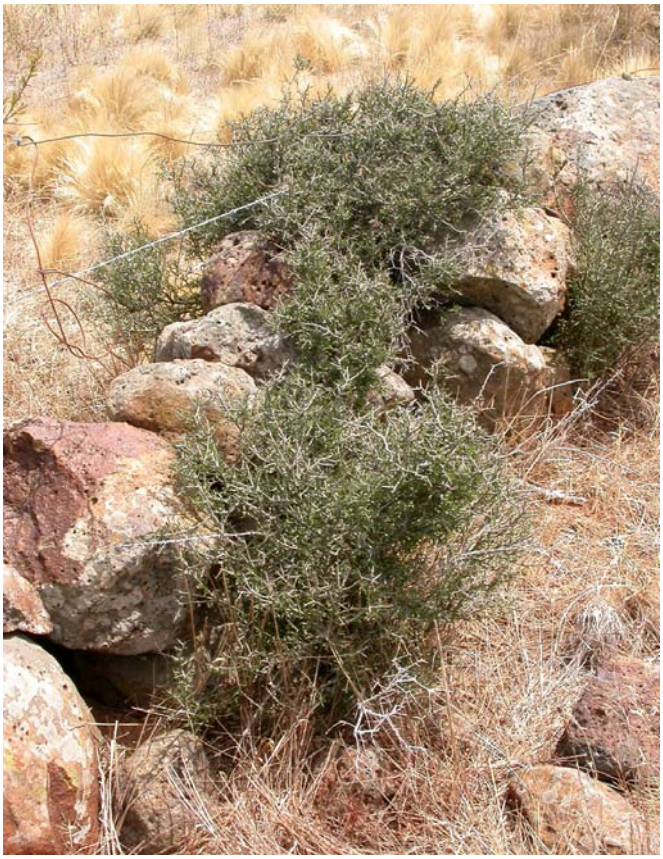

Plate 16: Tangled Shrub-violet (*Melicytus* sp. aff. *dentatus* (Volcanic Plains variant) growing in rock wall, Bush's Paddock, Mt Cottrell (November 2006)

Table 7: Threatened and Migratory/Marine Overfly species recorded under the Atlas of Victorian Wildlife (DSE 2004) for the Pinkerton Forest and Bush's Paddock Data Review Area (DRA), or listed as potentially occurring (or suitable habitat potentially occurring) under the DEH EPBC Protected Matters database, and their likelihood of occurrence in the study areas.

Pinkerton Forest and Bush's Paddock 1.5km radius DRA
Species list from irregular area bounded by the rectangle :
Latitude: -37°46'09" to -37°47'25" Longitude: +144°34'30" to +144°35'50"
Number of Surveys in Search Area = 11
Species range : 1 - 5999 Number of species found = 134
Data from Atlas of Victorian Wildlife - 24 March 2004

Key
EPBC – *Environmental Protection and Biodiversity Conservation Act* 1999
NAP – National Action Plan
FFG – *Flora and Fauna Guarantee Act* 1988
DSE – Status according to DSE (2003): Advisory List of Threatened Vertebrate Fauna in Victoria – 2003.
CE – Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near Threatened; LC – Least Concern; LR-NT – Lower Risk- Near Threatened; R-IK – Rare or Insufficiently Known; R/R – Rare and Restricted; DD – Data Deficient; CD – Conservation Dependent.
L – Listed under the FFG Act 1988.
N – Nominated for listing under the FFG Act 1988
I – Ineligible for listing under the FFG Act 1988.
Mi – Migratory species under the EPBC Act 1999
M – Marine overfly species under the EPBC Act 1999
Last – Year of last record
Rec – Number of records in Fauna DRA; NR – Not previously recorded in fauna DRA
- highlighted as potentially occurring or suitable habitat potentially occurring under the DEH Protected Matters database (those shown are relevant to the study area)
Cmp – Composite species
LRO – *CURRENT* Likelihood of Regular Occurrence

Common Name	Scientific Name	Last	Rec	EPBC	NAP	FFG	DSE	LRO
Birds								
#Australian Painted Snipe	*Rostratula benghalensis australis*	NR		VU		L	CE	Low
Stubble Quail	*Coturnix pectoralis*	1990	2	M				High
Brown Goshawk	*Accipiter fasciatus*	1990	2	Mi,M				Confirmed, High
Little Eagle	*Hieraaetus morphnoides*	1990	3	Mi				Moderate
Whistling Kite	*Haliastur sphenurus*	1990	3	Mi,M				Confirmed, High
Black Kite	*Milvus migrans*	1988	1	Mi				Low
Black-shouldered Kite	*Elanus axillaris*	1990	2	Mi				High
Peregrine Falcon	*Falco peregrinus*	1990	2	Mi				Moderate
Brown Falcon	*Falco berigora*	1990	4	Mi				High
Nankeen Kestrel	*Falco cenchroides*	1990	2	Mi,M				Confirmed, High
Southern Boobook	*Ninox boobook*	1988	1	M				Confirmed, High
Swift Parrot	*Lathamus discolor*	1988	1	EN,M	EN	L	EN	Low
#Regent Honeyeater	*Xanthomyza phrygia*	NR		EN		L	CE	Negligible
Sacred Kingfisher	*Todiramphus sanctus*	1988	3	M				Confirmed, Moderate

Common Name	Scientific Name	Last	Rec	EPBC	NAP	FFG	DSE	LRO
#White-throated Needletail	*Hirundapus caudacutus*	NR		Mi,M				Moderate
Rainbow Bee-eater	*Merops ornatus*	1988	1	Mi,M				Low
Pallid Cuckoo	*Cuculus pallidus*	1988	1	M				High
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	1988	2	M				High
Black-eared Cuckoo	*Chrysococcyx osculans*	1988	1	M			NT	Low
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	1988	4	M				High
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	1988	1	M				High
Welcome Swallow	*Hirundo neoxena*	1990	3	M				Confirmed, High
Tree Martin	*Hirundo nigricans*	1988	3	M				Confirmed, High
Flame Robin	*Petroica phoenicea*	1990	1	M				High
Hooded Robin	*Melanodryas cucullata*	1988	1		NT	L	NT	Low
Magpie-lark	*Grallina cyanoleuca*	1990	2	M				Confirmed, High
Crested Bellbird	*Oreoica gutturalis*	1988	1		NT	L	NT	Negligible
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	1988	3	M				Confirmed, High
Grey-crowned Babbler	*Pomatostomus temporalis*	1976	1		NT	L	EN	Negligible
Speckled Warbler	*Chthonicola sagittata*	1988	3		NT	L	VU	Low
Rufous Songlark	*Cincloramphus mathewsi*	1988	1	Mi				Low
Brown Treecreeper	*Climacteris picumnus victoriae*	1988	2		NT		NT	Confirmed, High
Silvereye	*Zosterops lateralis*	1990	3	M				High
Black-chinned Honeyeater	*Melithreptus gularis*	1988	2		NT		NT	Negligible
Australian Pipit	*Anthus australis*	1990	2	M				Confirmed, High
Diamond Firetail	*Stagonopleura guttata*	1988	2		NT	L	VU	Confirmed, High
Little Raven	*Corvus mellori*	1990	5	M				Confirmed, High
Mammals								
#Grey-headed Flying Fox	*Pteropus poliocephalus*	NR		VU		L	VU	Low
Reptiles								
#Striped Legless Lizard	*Delma impar*	1990	1					Moderate
#Grassland Earless Dragon	*Tympanocryptis lineata pinguicolla*	1988	1					Negligible
Frogs								
Growling Grass Frog	*Litoria raniformis*	1988	1	VU	VU	L	EN	Low
Invertebrates								
#Golden Sun Moth	*Synemon plana*	NR		CE		L		Moderate

4.3.4 Analysis of BOCA bird survey data

An extensive set of bird surveys totalling 852 species records between 2004 – 2005 (with additional incidental records back to 2002 from secondary sources) were conducted and collated by the Bird Observers Club of Australia (BOCA), and provided to Ecology Australia in raw form by

Dave Torr (by e-mail, 29 November 2006). The surveys were undertaken opportunictically, and were not distributed evenly by either month or season (D. Torr pers comm.) (Tables XX and XX).

These bird survey data were analysed by entering the records into a specialised database (BirdInfo, Intelligent Birding software, Canberra), and then output for a range of time periods, as as relative abundance (incidence as %) spreadsheets.

The survey effort shows a clear bias for Spring surveys for both Bush's Paddock and Pinkerton Forest (Figure 3). We recommend that future surveys target Summer, Autumn and Winter to make for a more even sampling effort.

The monthly surveys are more evenly distributed at Pinkerton Forest than at Bush's Paddock, but both show a clumped distribution of survey effort (Figure 4). There are currently no survey data for January, March, June and September for either site. At Bush's Paddock the months of August, November and December are over-repesented, and for Pinkerton Forest the months of May and November are over-represented. In designing a future survey program to address the seasonal imbalance, we also recommend that an attempt be made to distribute survey effort more evenly across the months.

The total number of bird species recorded from the Bush's Paddock-Pinkerton Forest study area from all sources is 81 (see Appendix 8)

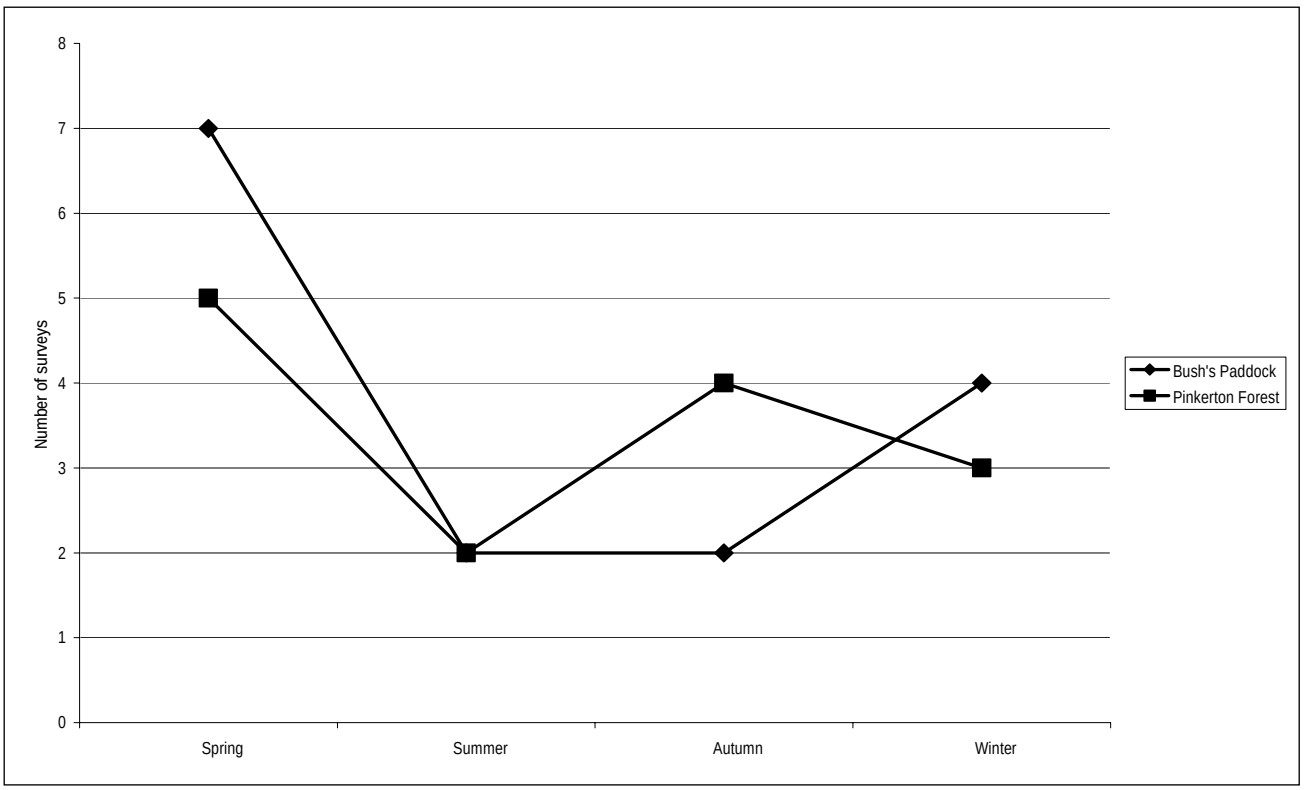

Figure 3: Distribution of BOCA bird survey effort by season

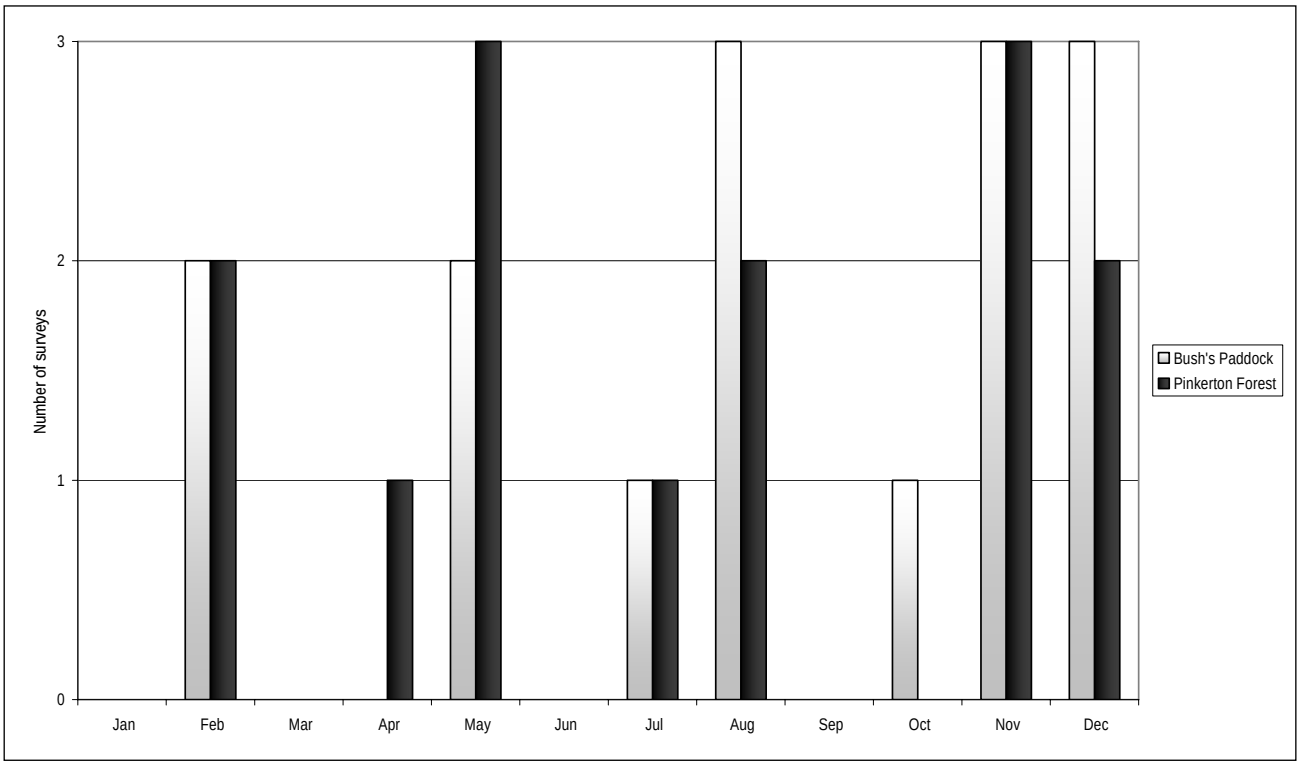

Figure 4: Distribution of BOCA bird survey effort by month

5 Prior Management

Pinkerton Forest and Bush's Paddock have been managed by Pinkerton Landcare and Environment Group who have clearly had a large positive impact at both sites.

Management of Bush's Paddock has included extensive weed control, particularly for Serrated Tussock (**Nassella trichotoma*), and some supplementary planting (Plate 17 and 18). Pinkerton Landcare and Environment Group have undertaken the following actions as part of an Integrated Weed Control program:

- Burning;
- Boom spraying;
- Spot spraying;
- Grazing; and
- Spray topping.

These are among well-knonw management options for Serrated Tussock control. Additionally, wick wiping was trialled at the site. The results were acceptable enough to use the machine on the previously cultivated back paddock.

Other management activities implemented in Bush's Paddock include:

- removal of Prairie Ground Cherry (**Physalis viscosa*);
- control of rabbits through poisoning, fumigation and ripping of burrows, and shooting;
- direct sowing of native grass seed; and
- propagation and planting of indigenous species including Drooping Sheoak (*Allocasuarina verticillata*), Basalt Podolepis (*Podolepis* sp.1), Pussy Tails (*Ptilotus spathulatus*), New Holland Daisy (*Vittadinia* sp.), Cotton Fireweed (*Senecio quadridentatus*) and Long-hair Plume-grass (*Dichelachne crinita*).

Pinkerton Forest has been managed in an attempt to return the forest to a more natural condition and allow natural regeneration of Grey Box (*Eucalyptus microcarpa*). Management activities have included:

- physical removal of boxthorn and burning of debris;
- spot-spraying of Serrated Tussock (**Nassella trichotoma*), as indicated by the presence of blue dye on plants;
- control of rabbits with a rabbit-proof fence, shooting and ripping of rabbit warrens; and
- propagation and planting of indigenous species. Including:

- Drooping Sheoak (*Allocasuarina verticillata*), Heath Spear-grass (*Austrostipa exilis*), Rough Spear-grass (*Austrostipa scabra*), Pussy Tails (*Ptilotus spathulatus*), New Holland Daisy (*Vittadinia* sp.) and Cotton Fireweed (*Senecio quadridentatus*) in Upper Pinkerton in 2006;
- Showy Podolepis (*Podolepis* sp. 1), Pussy Tails (*Ptilotus spathulatus*), and (*Eremophila deserti*) in the 'plains grassland' section of Pinkerton from 2003-2006; and
- Black-anther Flax-lily (*Dianella admixta*), Fragrant Saltbush (*Rhagodia parabolica*), Seaberry Saltbush (*Rhagodia candolleana*), Golden Wattle (*Acacia pycnantha*), Sweet Bursaria (*Bursaria spinosa*) in Lower Pinkerton in the early 1990s.

Pinkerton Landcare and Environment Group has informed us that strategic grazing has been used at both Bush's Paddock and Pinkerton Forest to remove annual grasses and reduce the growth of broad-leaved weeds. Sheep and cattle have both been used according to grazing height required, maturity of regrowth of Grey Box trees and availability of cattle or sheep. Grazing has occurred in later winter or early spring prior to seed-set by annual grasses and prior to herbs developing inflorescences. Seasonal grazing was used in accordance with results and recommendations from native grassland management and weed control in Victoria and New South Wales. The most vulnerable herb in the paddocks was used as the criterion for removing stock.

Plate 17: Serrated Tussock (**Nassella trichotoma*) at Bush's Paddock, Mt Cottrell (November 2006)

Plate 18: Serrated Tussock (**Nassella trichotoma*) (pale gold colour) at Pinkerton Forest, Mt Cottrell (November 2006)

6 Management Issues

6.1 Weeds

A total of 62 exotic plant species (43% of the flora) was recorded during field work (quadrat data collection and general floristic inventory) (Figure 5) (Appendix 1 and 2).

6.1.1 Weed management rationale

In the absence of weed management, the indigenous vegetation, indigenous plant species, and much of the fauna habitat values will be lost from the study area. However, the weed problem is currently tractable and it is opportune to design and implement a weed-management strategy.

In this section the following are outlined: the weed management rationale and strategy and statutory responsibilities, distribution and population status or weed species, invasiveness and risk rating, generic control methods, as well as priority of control or elimination.

6.1.2 Weed species selection criteria

Of the 62 weed species recorded in the study area (Appendix 1 and 2), 23 species are here identified for **control** or **elimination**. Of these, 9 are trees or shrubs, and 14 are biennial or perennial herbs. Life forms are given in Table 9. Selection criteria are as follows:

- robust species that are capable (as invaders) of destroying the indigenous vegetation (including the upper stratum and subordinate strata); these will become structural dominants of the vegetation at various time scales (no time constraint is applied here); and
- species whose current populations are so small that their elimination is feasible; and
- those species with a high visual impact.

Excluded are numerous species that are ubiquitous or locally abundant members of the ambient weed flora with vast populations, high seed or propagule production, and very effective dispersal; these are all herbaceous species, however they may need to be managed in connection with particular revegetation exercises. Effective control of these species is generally not feasible.

The **elimination** of some species is advocated because populations are small enough or the species is so seriously invasive that it poses a major threat, and **control** is advocated for others where populations are very large or the seed rain into the study area is a major ongoing factor.

Figure 5: Location of selected weeds recorded at Pinkerton Forest and Bush's Paddock

6.1.3 Fauna habitat values and weeds

Weed infestations can provide habitat values for fauna otherwise unavailable in the indigenous flora. This mostly relates to habitats for small birds which utilise numerous exotic species for cover, often in the absence of indigenous vegetation (Plate 19). No weed species would be excluded from the targeted list because of its faunal habitat values but weed removal may need to be staged to allow indigenous revegetation to provide appropriate cover, after which the weeds can be removed.

Plate 19: Dead boxthorn heap observed to be used by Diamond Firetails, Pinkerton Forest, Mt Cottrell (November 2006)

6.1.4 Statutory responsibilities

The *Catchment and Land Protection Act 1994* (CALP Act) obliges management agencies and owners to effect control of noxious weed species listed under the Act as 'Regionally Prohibited' or 'Regionally Controlled' within the relevant Catchment Management Authority region, in this case Port Phillip and Westernport. Nine weed species are listed as regionally 'Controlled', one is listed as 'Prohibited' and one is listed as 'Restricted' (Table 9).

6.1.5 Weeds of National Significance

The Commonwealth Government recently identified and declared 20 weed species as Weeds of National Significance (WONS) (www.weeds.org.au) because of the threat they pose to the economy, biodiversity and other values at a national scale. Under the WONS program national strategies are to be prepared for each species, identifying biology, ecology, threats and control options; several have been published for species occurring in the study area (e.g. *Nassella* species or *Rubus* species). Three of the weed species recorded in this study are WONS (Table 9) and all are rated here as highly invasive with a high priority for control. There is a statutory obligation to manage these weeds because they are also listed under the CALP Act.

6.1.6 Invasiveness and risk rating

In Table 9 the weed species are assigned to one of four categories of a subjectively-assessed risk rating to biodiversity and other values based on the distribution and age structure of the populations recorded in the study area (Table 9) and in the wider context (Carr *et al.* 1992). Statistics for this break-down are given in Table 8.

Table 8: Invasiveness and risk rating for weed species identified for management, Bush's Paddock and Pinkerton Forest November 2006

Risk rating	Attributes of weeds	Number of weed taxa
1	Highly invasive and a very serious threat to vegetation *or* its recruitment	**5**
2	Moderately invasive and a serious threat to vegetation *or* its recruitment	**9**
3	Weakly invasive or a slow invader; a longer-term threat to vegetation *or* its recruitment	**7**
4	A minor threat to vegetation but a species with a moderate to high visual impact (lifeform, foliage or flowers)	**2**
	Total	**23 taxa**

6.1.7 Priority of control

The risk rating has been used to assign priority of control to weed species (Table 9), with a time-frame given; also considered in this assignment of priority is the size and distribution of populations of the species, the age structure of populations (an indicator of how fast they move), and the tractability of control.

6.1.8 Control methods

The methods used to treat – control or eliminate – weed species from a given area or the study area generally are given in Table 9; the methods fall into two categories: (i) herbicide treatment and (ii) physical methods. The methods indicated are the only viable techniques to kill the target species or are the most appropriate to the circumstances in the study area, particularly in respect of the distribution and population status of the species. The preferred method is generally listed first.

6.1.9 Distributions and population status

The 23 weed species identified for control or elimination in Table 9 have been assigned to four categories representing a subjective assessment of their distribution and population status. In terms of guiding selection of species to target, the distribution and abundance of many species was also considered when *excluding* species: those numerous, extremely abundant herbaceous species which occur generally throughout the study area.

6.1.10 Management strategy

Good quality weed control has already been undertaken by Pinkerton Landcare and Environment Group, Melton Shire Council and their contractors. In addition to current weed control activities, the following weed management strategy is envisaged:

1. Methods to treat individual species or populations (Table 9) include herbicide application to foliage and physical removal by hand, machinery or stock grazing as appropriate.

2. The primary weed management program targeting woody weeds, should extend over a two-year period. This would be followed up by maintenance weed control which will be an ongoing concern.

3. Weed monitoring will be an ongoing concern – to identify weed populations and respond with control as appropriate.

4. Damage to indigenous vegetation (by herbicide or machinery and to soils) must be avoided at all times.

5. Weed management contractors and operators must be suitably qualified and appropriately certified, and armed with the requisite weed and indigenous plant identification, etc., knowledge. All health and safety, and environmental regulations, must be rigorously observed.

6. All aspects of the control program need to be appropriately documented (to an agreed standard) to enable the tracking and evaluation of control methods/activities, and to allow for refinement of procedures, as well as inform future weed management activities.

   Burning of stockpiled material may require a permit from the CFA and the CFA may need to agree to carry out the burning.

7. Revegetation, by which it is intended to provide competition to weeds from indigenous species, is a necessary follow-up activity following weed removal. Revegetation can commence on any site following weed control when it is clear that the target weeds have been effectively controlled or eliminated.

6.1.11 Implementation of weed management

The following steps are required to prepare a work plan.

1. Map the weed species targeted for action (location and extent of populations or individuals) to define the scope of work required. Mapping of soe weed locations has occurred in Bush's Paddock.
2. Identify potential off-target damage that may result from weed-control activities in the location(s) of the weed population(s). This mostly relates to herbicide damage to indigenous plant species.
3. Identify weed populations that may be short-term value as fauna habitat.
4. Further evaluate the extent of populations of Texas Needle-grass (**Nassella leucotricha*) due to the uncertainty of identifying sterile grasses in a poor season. This will form part of a follow-up survey.
5. Devise time lines – calendar of tasks – identifying for each species the window of opportunity in which tasks must be implemented, for example destroying seed crops before they ripen and treating weed species with herbicide at the most appropriate time to ensure effective control.
6. Determine the level of funding available for the weed management program and then prepare a works program identifying: targeted weed species, areas in which they occur, method(s) appropriate to effect control on a species-by-species and/or a site basis; a calendar of tasks; performance measures, etc.
7. Go for it!

Table 9: Weed species information table for the 23 species identified for control or elimination at Bush's Paddock and Pinkerton Forest, including their lifeform, distribution and population status in the study area and control methods

Life form (mostly after Carr et al. 1992)

A	annual
B	biennial
Pr	perennial herb (rhizomatous or stoloniferous)
Pt	perennial herb (tufted or tussock-forming)
Ss	subshrub
Ls	large shrub
T	tree
X	Succulent herb, subshrub or shrub

Distribution and population status

1	Widespread, medium to large populations
2	Widespread, small populations
3	Limited distribution, medium to large populations
4	Limited distribution, small populations
5	Rare or localised, medium to large populations
6	Rare or localised, small populations

Invasiveness and risk rating

1	Highly invasive and a very serious threat to vegetation or its recruitment
2	Moderately invasive a serious threat to vegetation or its recruitment
3	Weakily invasive or a slow invader a minor threat to vegetation or its recruitment
4	A minor threat to vegetation but a species with a moderate to high visual impact (life form, foliage and/or flowers)

Noxious weed/WONS

R	Weeds listed as RESTRICTED under the *Catchment and Land Protection Act 1994* – they must not be sold or traded in Victoria.
C	Weeds listed as CONTROLLED under the *Catchment and Land Protection Act 1994* – landholders have the responsibility to control and prevent the spread of these weeds on their land
P	Weed listed as PROHIBITED under the *Catchment and Land Protection Act 1994* – landholders have responsibility to control these weeds on their land
WONS	Weed of National Significance (www.weeeds.org.au)

Control method(s)

A	**Herbicide treatments**
1	Herbicide applied to foliage with spray, wick applicator, etc
2	Cut down and concentrated herbicide immediately applied to stump or stems, or bark "frilled" and herbicide applied.
3	Stem drilled and injected with concentrated herbicide.
B	**Physical treatments**
4	Physical removal – most plants can be physically removed by hand-weeding or with tools when small and/or isolated but soil disturbance is kept to a minimum.

Species	Common name	Family	Life form	Recorded at site		Distribution and population status						Invasiveness and Risk Rating				Listed weed species		Control methods
				BP	PK	1	2	3	4	5	6	1	2	3	4	WONS	CALP Act	
Weeds to ELIMINATE																		
Chamaectyisus palmensis	Tree Lucerne	Fabaceae	Ls	✓							?			3		–	–	4
Cynara cardunculus	Spanish Artichoke	Asteraceae	B	✓							6		2			–	C	1
Eucalyptus cladocalyx	Sugar Gum	Myrtaceae	T	✓							6				4			
Lycium ferocissimum	African Box-thorn	Solanaceae	Ls	✓	✓		2					1				–	C	2,4
Nassella neesiana	Chilean Needle-grass	Poaceae	Pt	✓					4			1				✓	R	1
Nassella trichotoma	Serrated Tussock	Poaceae	Pt	✓	✓	1						1				✓	C	1
Opuntia ficus-indica	Indian Fig	Cactaceae	X		✓						6			3		–	–	1,4
Physalis viscosa	Prairie Ground-cherry	Solanaceae	P	✓	✓				4			1				–	P	1
Phytolacca octandra	Red-ink Weed	Phytolaccaceae	Ss								6			3		–	–	4
Prunus cerasifera	Cherry-plum	Rosaceae	T	✓							6			3		–	–	2,3,4
Rosa rubiginosa	Sweet Briar	Rosaceae	Ls	✓			2						2			–	C	1,2
Rubus fructicosus spp. agg.	Blackberry	Rosaceae	Ls	✓							6			3		✓	C	1
Silybum marianum	Variegated Thistle	Asteraceae	A	✓							6		2			–	–	1,4
Solanum linneanum	Apple of Sodom	Solanaceae	S	✓							6			3		–	C	1,4
Verbascum thapsus	Great Mullein	Scrophulariaceae	B	✓							6				4	–	C	1,4
Xanthium spinosum	Bathurst Burr	Asteraceae	A	✓							6			3		–	C	1,4

Species	Common name	Family	Life form	Recorded at site		Distribution and population status						Invasiveness and Risk Rating				Listed weed species		Control methods
				BP	PK	1	2	3	4	5	6	1	2	3	4	WONS	CALP Act	
Weeds to CONTROL																		
Cirsium vulgare	Spear Thistle	Asteraceae	B	✓			2						2			–	–	1,4
Dactylis glomerata	Cocksfoot	Poaceae	Pt	✓									2			–	–	1
Galenia pubescens var. pubescens	Galenia	Aizoaceae	Pr	✓	✓			3					2			–	–	1,4
Helminthotheca echioides	Ox-tongue	Asteraceae	Pt	✓			2						2			–	–	1
Marrubium vulgare	Horehound	Lamiaceae	Pt	✓	✓			3					2			–	C	1,4
Paspalum dilatatum	Paspalum	Poaceae	Pt	✓							6		2			–	–	1
Phalaris aquatica	Toowomba Canary-grass	Poaceae	Pr	✓			2					1				–	–	1

6.2 Pest animals

6.2.1 Grazing and browsing

Rabbits

Rabbits typically have a very strong influence in determining the floristic composition and structure of both the indigenous and exotic flora. Rabbit grazing is selective and sometimes very localised. Some species are essentially immune to rabbit grazing because they are toxic, defensively well-armed (spiny/prickly) or unpalatable (i.e. nutritionally of very low quality). Species that are palatable are likely to have very small populations because most recruits are destroyed by rabbits; only rare individuals can become established in 'safe' sites. It thus follows that when rabbit numbers are reduced by management intervention, which is essential if revegetation is to be effective, then the flora will change in floristic composition and structure. Such changes may be dramatic but the dynamics of vegetation change are not known.

Rabbit numbers in Pinkerton Forest and Bush's Paddock were assessed as being at approximately level 4 on the modified McLean/Gibb Scales (Bloomfield 1999) during this study. Regular monitoring using the McLean/Gibb scale is recommended in order to maximise the opportunity to detect changes in population size, and to measure the effectiveness of control measures.

Integration of several control techniques increases the likelihood of rabbit control methods being successful (Williams et al. 1995). Control techniques should also be combined where possible with other aspects of land management, seasonal cycles of weather, seasonal cycles of rabbit biology, dry periods or droughts, and myxomatosis outbreaks (Williams et al. 1995).

Because of the proximity of the study area to residential areas, use of conventional 1080-treated carrot or oat bait may not be appropriate for areas without predator-exclusion fencing (such as Bush's Paddock). There is a high risk of secondary poisoning of pet dogs and cats (by ingestion of poisoned carcasses). Consequently, all rabbit poisoning at Bush's Paddock should focus on use of pindone-treated carrot bait. Such bait should be hand broadcast over all rabbit feeding areas. Assistance can be obtained from the local DPI office. The technique requires that rabbits be fed with the pindone-treated bait on two separate occasions, between three and five days apart. Baiting rates will need to be adjusted according to indicated rabbit numbers. Baiting at Pinkerton Forest (within the rabbit-proof fence) can utilise conventional 1080 baits. An initial poisoning campaign (ideally in late-summer or early-autumn) should be followed up with warren fumigation.

Fumigation of warrens with aluminium phosphide tablets is a control option for active warrens. Fumigation is possible where warren entrances are accessible to humans, and should be carried out in autumn before the onset of rabbit breeding. At this time, soil moisture is sufficient to generate the toxic phosphine fumes and rabbits will be controlled before they have the opportunity to breed. For efficient fumigation, the use of a power fumigator is recommended (obtained from local DPI offices). All holes, active or inactive, must be treated with tablets (1 or 2 per hole) and securely blocked with soil.

Temporary fencing should be implemented around revegetation areas and plant guards should be used, plus baiting to maintain low rabbit numbers within the reserve. Where possible, rabbit harbour should be reduced. However, where artificial structures and exotic vegetation provide habitat for indigenous fauna they may need to be gradually removed and replaced with indigenous species that perform the same function. Rocks and logs should not be removed because they provide valuable habitat for indigenous fauna species.

Table 10: Modified McLean/Gibb Scales of Rabbit Infestation

	McLean Scale	Level	Gibb Scale
Existing conditions in December 2006	No rabbits or sign seen	1	Very few droppings, sometimes grouped, easily overlooked
	No rabbits seen, some sign noticeable	2	Very infrequent heaps, little if any scatter
	Odd rabbit seen, sign and some buck heaps showing up	3	Infrequent heaps, very light and patchy scatter
	Pockets of rabbits, sign and fresh burrows noticeable	4	Frequent heaps, light and patchy scatter
Indicates an increase over existing conditions – action required			
	Infestation spreading out from heavy pockets	5	Heaps occasionally within five paces of each other, moderate scatter overall
	Infestation over whole area and increasing	6	Heaps often within five paces of each other, dense scatter
	Infestation heavy, rabbits moving in droves, pasture damage, warrens	7	Usually two or three heaps within five paces of each other, dense scatter.
	Infestation at high level throughout, severe pasture and vegetation damage	8	Usually three or more heaps within five paces of each other, dense scatter overall
	Infestation almost at peak	9	Some heaps almost merging, scatter very dense
	Maximum level, rabbits must spread out over wide area or starve	10	Some heaps merging, very dense scatter overall

Hares

Brown Hares (**Lepus capensis*) are present and relatively abundant in Bush's Paddock, but are effectively excluded from most of Pinkerton Forest.

Hares are known to cause adverse impact on indigenous flora; particularly browsing regrowth and replanted woody vegetation. The only practical way to manage hares would be by shooting rather than poisoning.

Stock

Pulse grazing by sheep in summer is advocated as a means of biomass reduction. We do not believe that cattle should be used because of the potential damage to soils (e.g. compaction) and vegetation. Cattle may be more effective dispersers of weed seed in faeces and cow pats (due to their large size) have a serious smothering effect on plants.

To exclude grazing now after a long history of stock grazing may result in undesirable changes in floristics and structure of the weed flora. There are many instances of grasslands and grassy woodlands seriously degrading following removal of stock because they are viewed as conflicting with biodiversity conservation. The intensity, timing and frequency of grazing must be carefully controlled to avoid damage to vegetation. In the context of Pinkerton Forest and Bush's Paddock, more work is needed to refine the grazing regime and trials may be required which may include establishing grazing exclosures. Any grazing regime or trials should be carefully documented and outcomes evaluated.

Any sheep introduced need to be quarantined and fed clean feed for a period of time prior to their introduction in order to prevent introduction of weeds via faeces.

The use of grazing for control of annual grasses is potentially problematic. To control reproduction of annual grasses the grazing has to be precisely timed to coincide with the early stages of flowering; later in the season grass inflorescences become unpalatable to deter grazers. However, if grazing is used too early in the season there may be opportunity for the annual grasses to produce new flowers after the initial grazing bout. The effect on exotic grasses of stock grazing also greatly depends on the availability of other food sources in the area and seasonal conditions. The use of stock to control annual grasses has been poorly tested anywhere and we have some reservations that there might be significant damage to the indigenous flora and soils. Grass specific herbicide (e.g. Fusilade) may be more appropriate either to kill annual grasses at an early stage or by spray topping to destroy flower/seeds. Fire and mechanical control (slashing) is also a potentially useful means of controlling annual grasses (see McMahon 1991).

Indigenous fauna – Kangaroos and Common Brushtail Possums

Kangaroos and possums may have severe impacts on the vegetation community or individual plant species when grazing/browsing pressure is excessive. Some parts of the Brisbane Ranges, for example, suffer excessive kangaroo grazing.

The number of kangaroos is currently small but there is potential for population growth particularly when cover is introduced by revegetation. Kangaroos are desirable as natural grazing mammals for biomass reduction, but numbers need to be managed so they do not exceed the carrying capacity of the vegetation, harm soils, cause death of indigenous plant, recruitment failure, or promote weed invasion.

Possum damage by browsing of foliage is most severe in fragmented landscapes and may result in widespread death of eucalypts. In some parts of Australia, particularly in urban parks and parts of Tasmania, over-browsing eucalypts by possums has been identified as a contributing factor to tree

death, and forest and woodland die-back. Possums are an overlooked aspect of rural and urban tree decline and health; they are in fact severely underrated as a cause of tree decline.

The Common Brushtail Possum is listed as protected wildlife in Victoria, and there are legislative and policy restrictions on the kinds of direct actions available to manage populations (particularly downwards). Accordingly, the methods available to minimise browsing effects on trees are limited.

Typically trees which are showing signs of over-browsing, but which are still alive and showing some signs of maintained vigour, (eg. re-shooting leaves), can be protected from possum (and Koala *Phascolarctos cinereus*) over-browsing by banding (also known as collaring). Banding involves putting a plastic or sheet-metal band or collar, not less than 60cm wide, around the trunk of a tree, designed to make it impossible for arboreal mammals to climb up to the canopy of that tree (DSE 2003). Any neighbouring trees which have substantial canopy limbs interconnected with those of the target tree should also be banded. Other trees with substantial canopy limbs within about two metres of the target tree should also be banded, or lopped to make the distance between trees greater than two metres, and therefore not within 'possum jumping' distance.

These actions should preferable be undertaken by a qualified and experienced arborist, and with the overall benefit of trees in the stand as the principal goal.

Current numbers of Common Brushtail Possums in Pinkerton Forest are at about 20-25 possums over 35 ha = 0.7 possums per hectare. This needs to be monitored, but it is not yet a problem.

6.2.2 Feral predators

Both Foxes *Vulpes vulpes* and feral Cats *Felis catus* are known to occur in the study area, and a number of Foxes were seen in both Pinkerton Forest and Bush's Paddock during fieldwork for this study. Predation by these exotic carnivores on native animals such as birds, mammals and reptiles is well documented, and both are listed threatening processes under both federal and state legislation (Mansergh and Marks 1993; Seebeck and Clunie 1997).

Feral Cats

The most appropriate control measures for feral Cats in the study area are trapping and shooting.

Foxes

Fox predation is outlined as a Threatening Process in the Action Statement produced under the *Flora and Fauna Guarantee Act 1988* (see Mansergh and Marks 1993). As the fox is a highly mobile animal and would occur in surrounding areas, any control action on foxes would be less effective unless surrounding land managers also took similar action in a co-ordinated community-based scheme over a large area (see Saunders et al. 1995). However, any den sites located in the reserve should be destroyed.

Discussion of a possible poisoning campaign should then involve the Departments of Sustainability and Environment (DSE) and Primary Industries (DPI), professional baiters and local landholders.

The only available poison is 1080. A co-ordinated poisoning program would require the permission of DSE, the provision of ample signage and a restriction on the entry of domestic animals to the site while poisoning was in operation (note that 1080 areas are advocated as 'pet exclusion areas'). The preferred method of baiting would be to establish bait stations (small, raised hillocks of sand in which toxic bait, available from DSE, is buried). Pre-feeding with un-poisoned baits would be a useful precaution since possible visitation of the sites by non-target species could then be checked.

Baiting can only be undertaken by a professional baiter.

6.3 Waste-water irrigation

Irrigation of the woodlands with nutrient-enriched water at either Pinkerton Forest or Bush's Paddock is not recommended. The effects on woodlands and forests of irrigating with nutrient-enriched water have not been studied. However, it can be expected that irrigating the woodlands may exacerbate weed invasion through an increase in nutrients and water (in an otherwise quite dry environment); alter the hydrology of the woodlands; and potentially have adverse physiological effects on indigenous plant species, for instance, an increase in nutrients may make leaves more palatable to insect defoliators. It is recommended that the watering of eucalypts outside the fenced area should cease (Plate 20).

Plate 20: Eucalypts in the sourthern section of Pinkerton Forest, Mt Cottrell (November 2006)

6.4 Fire

Fire has been used for decades as a management tool in grasslands to reduce biomass. Frequent biomass removal is required to maintain both Kangaroo Grass (*Themeda triandra*) swards and associated herb diversity. It is recommended that the grassland be burnt not more than once every four years in a manner that mimics the natural regime. Burns for logistic and practical reasons (that is when they can safely and effectively implemented) should be in early autumn outside the fire danger season but before the autumn break. Spring fires are not desirable because they interfere with reproductive cycles of indigenous species. The most desirable (and natural) season for burns is summer, but risk management precludes this timing.

Fire as a management technique is not advocated for the woodlands at Bush's Paddock and Pinkerton Forest. Shrub cover and recruitment is currently low in these communities. The effect of burning the woodland is unknown and may conflict with recruitment of trees and shrubs. Additionally there is the no need to reduce the biomass of Kangaroo Grass as is in the grasslands. However, if a wildfire burns the woodland, vegetation should not be damaged in order to control the fire. Letting the woodland burn and creating firebreaks on the edge of the remnants rather than bulldozing or clearing vegetation to create firebreaks within the boundary of the reserve is essential to avoid damage to soils, vegetation and faunal habitat.

Any areas that are burnt, either intentionally or unintentionally, should be monitored in order to assess the effect of fire on recruitment and regeneration of both indigenous and exotic species. Early management intervention, for example weed control, may be required following fire.

6.5 User-related issues

Pinkerton Forest and Bush's Paddock have relatively high ecological values and are very important remnants of once widespread communities. They are reserved for conservation and should not be used for purely recreational purposes. Any activities that take place in the remnants must be compatible with their conservation values, for example nature-based activities should be tolerated. There is likely to be a need to monitor user-related impacts in future to determine possible adverse effects. These may include physical damage to vegetation and soils and disturbance of wildlife.

6.6 Revegetation

Revegetation of the study area is required to enhance the flora and fauna values and visual amenity of the area, as well as being part of the weed management strategy; revegetation with trees, shrubs and robust perennial herbs will provide competition for weeds. Such competition will assist in reducing germination and establishment of some weed species. Some revegetation has already been carried out by Pinkerton Landcare and Environment Group but there is ample scope for further revegetation, as part of a larger restoration plan.

Plant species from the **extant** and **reconstructed flora** suitable for revegetation in all zones are given in Table 11. Included are the intended structural role and/or abundance of the species within a zone, its life form, as well as comments. Indigenous plant species have been selected for revegetation because they occur naturally in the study area; or have a high probability of being original members of the flora based on data from the Flora Information System database (sites where Grey Box has been recorded) and extensive observations on the floristics of regional Grey Box woodlands, plus knowledge of the ecology and biology of the species involved and numerous studies carried out in the eastern Victorian Volcanic Plain bioregion.

It is very important to plant species in the correct *ecological situation* for several practical and philosophical reasons, viz.:

- restoration of this kind demands that plantings make *ecological sense,* i.e. species 'belong' in *particular environments* and plant *species associations.* In this way the area will achieve maximum scientific, educative and interpretive value.
- plants placed in the incorrect physical environment (e.g. too shady or dry) may not perform well or die;
- these plantings with their biodiversity and landscape enhancement objectives may become a model for other revegetation projects. Presenting undesirable (incorrect) models must be avoided.

Similarly it is also important to utilise plant material in the correct structural way, i.e. place species in ecologically plausible population sizes and densities (spacing), and distributed in the landscape in a 'natural' way.

At all times the intention should be to produce a landscape which will develop a 'natural' feel, as opposed to one that bears the hallmarks of human intervention, such as plants in incorrect places, trees growing with plantation-like form in dense stands and plants in straight lines or equidistant spacings.

6.6.1 Aims and objectives of revegetation

Revegetation and weed control are the main management activities required for the study area.

The often complementary aims and objectives of revegetation with indigenous species of the existing or former indigenous vegetation may include:

- Creation, restoration or enhancement of the floristic composition and structure of indigenous vegetation;
- Augmenting populations of plant species that are in decline through senescence and/or recruitment failure, for example Black-anther Flax-lily (*Dianella admixta*), Small-leaved Clematis (*Clematis microphylla*), Drooping Sheaoak (*Allocasuarina verticillata*), Lightwood (*Acacia implexa*) and Small-flower Mat-rush (*Lomandra micrantha*).
- Re-introducing species that are no longer found in the vegetation communities but are known from nearby remnant vegetation and are reasonably assumed to have occurred in the former vegetation;

- Introducing rare or threatened species, that is using the sites as ex-situ conservation reserves;
- Provision of general or specific habitat attributes for indigenous fauna communities or particular animal species; this may include 'corridors' for faunal movements and to increase or enhance 'connectivity', however this scarcely applies to the study area outside the Werribee River environment because of the extreme scarcity of indigenous vegetation locally away from the river.

A list of plant species suitable for revegetation is given in Table 11.

Table 11 Indigenous plant species selected for revegetation, Bush's Paddock and Pinkerton Forest

Revegetation zones

Zone 1 Pinkerton Forest Plains Woodland
Zone 2 Bush's Paddock Plains Woodland
Zone 3 Bush's Paddock Plains Grassy Woodland
Zone 4 Bush's Paddock Low-rainfall Plains *Themeda* Grassland
Zone 5 Bush's Paddock Low-rainfall Plains *Austrostipa/Austrodanthonia* Grassland including drainage line
+ Drainage line only

Structural role of plant species

A Structural dominant of the vegetation stratum – the sole or predominant species locally or across broader expanses or the whole vegetation zone; with high overall cover within particular location
B Localised Structural co-dominant (with other species) in vegetation stratum
C Scattered thinly or discontinuously as small groups or isolated individuals (trees/shrubs and perennial herbs); with low overall cover
D Scattered and infrequent across a wide area
E Localised stands/aggregations in defined environments

Propagation method **Note**: method in brackets is least preferred

C Cuttings
D Division
S Seed
R Root suckers
B Ripe seed extracted from fruit and sown on (applied to) branches of host tree

Species	Common Name	Vegetation Zones					Structural role of plant species	Propagation
		1	2	3	4	5		
Trees								
Acacia implexa	Lightwood	✓	✓			✓	C	S
Allocasuarina luehmannii	Buloke	✓	✓			✓	B	S
Allocasuarina verticillata	Drooping Sheoak	✓	✓			✓	B	S
***Eucalyptus* aff. *baueriana* (Werribee River Catchment)**	Werribee Blue Box	✓	✓				A	S
Eucalyptus camaldulensis	River Red Gum			✓			A	S
Eucalyptus melliodora	Yellow Box	✓	✓			✓	A	S
Eucalyptus microcarpa	Grey Box	✓	✓			✓	A	S
Exocarpus cupressiformis	Cherry Ballart	✓	✓			✓	D	S
Shrubs								
Acacia acinacea	Gold-dust Wattle	✓	✓			✓	B	S
Acacia paradoxa	Hedge Wattle	✓	✓			✓	B	S
Acacia pycnantha	Golden Wattle	✓	✓			✓	B	S

Species	Common Name	Vegetation Zones					Structural role of plant species	Propagation
		1	2	3	4	5		
***Acacia verniciflua* (Bacchus Marsh variant)**	Bacchus Marsh Varnish Wattle	✓	✓				B	S
Bursaria spinosa* subsp. *spinosa	Sweet Bursaria	✓	✓	✓			C	S,(C)
Cassinia arcuata	Drooping Cassinia	✓	✓	✓			D	S,(C
Dillwynia cinerascens	Grey Parrot-pea	✓	✓	✓		✓	E	S,(C
Dodonaea viscosa* subsp. *spatulata	Sticky Hop-bush	✓	✓				E	S
Eremophila deserti	Turkey Bush	✓	✓				E	S,C
Eutaxia microphylla* var. *diffusa	Spreading Eutaxia	✓	✓			✓	E	S,C
Eutaxia microphylla* var. *microphylla	Common Eutaxia	✓	✓			✓	E	S,C
Melicytus dentatus	Tree Violet	✓	✓			✓	C	S,(C)
***Melicytus* sp. aff. *dentatus* (Volcanic Plains variant)**	Tangled Shrub-violet	✓	✓			✓	C	S
Nicotiana suaveolens	Austral Tobacco	✓	✓				E	S
Ozothamnus obcordatus	Grey Everlasting	✓	✓			✓	E	S,C

Species	Common Name	Vegetation Zones					Structural role of plant species	Propagation
		1	2	3	4	5		
Pimelea glauca	Smooth Rice-flower	✓	✓			✓	E	C,(S)
Pimelea spinescens* subsp. *spinescens	Spiny Rice-flower			✓	✓		E	C,(S)
Rhagodia parabolica	Fragrant Saltbush	✓	✓					S,(C)
Subshrubs								
Atriplex semibaccata	Berry Saltbush	✓	✓			✓	C	S,(C)
Einadia hastata	Saloop	✓	✓			✓	D	S
Einadia nutans* subsp. *nutans	Nodding Saltbush	✓	✓			✓	C	S
***Enchylaena tomentosa* var. *tomentosa* (prostrate variant)**	Ruby Saltbush	✓	✓				B	S
***Enchylaena tomentosa* var. *tomentosa* (shrubby variant)**	Ruby Saltbush	✓	✓				B	S
Kennedia prostrata	Running Postman	✓	✓			✓	C	S,(C)
Maireana decalvans	Black Cotton-bush	✓	✓			✓	E	S

Species	Common Name	Vegetation Zones					Structural role of plant species	Propagation
		1	2	3	4	5		
Sclerolaena muricata* var. *muricata	Black Roly-poly	✓	✓			✓	E	S
Perennial Herbs								
Aristida behriana	Brush Wire-grass	✓	✓			✓	C	S,D
Arthropodium strictum	Chocolate Lily	✓	✓	✓	✓	✓	B	S
Austrostipa elegantissima	Feather Spear-grass	✓	✓				C	S
Bulbine bulbosa	Bulbine Lily	✓	✓	✓	✓	✓	C	S
Calocephalus citreus	Lemon Beauty-heads	✓	✓	✓	✓	✓	B	S,D
Chenopodium desertorum* subsp. *microphyllum	Small-leaf Goosefoot	✓	✓			✓	C	S,(C)
Chloris truncata	Windmill Grass	✓	✓	✓	✓	✓	B	S
***Chrysocephalum apiculatums* s.l.**	Common Everlasting	✓	✓	✓	✓	✓	B	S,C
***Chrysocephalum semipapposum* s.l.**	Clustered Everlasting	✓	✓			✓	E	S,C
Dianella admixta	Black-anther Flax-lily	✓	✓	✓	✓	✓	B	S,D
***Dianella* sp. aff. *longifolia* (Benambra)**	Arching Flax-lily	✓	✓	✓	✓	✓	C	S,D

Species	Common Name	Vegetation Zones					Structural role of plant species	Propagation
		1	2	3	4	5		
Lachnagrostis aemula	Leafy Blown-grass	✓	✓			✓	D	S,(D)
Lomandra micrantha* subsp. *micrantha	Small-flower Mat-rush	✓	✓			✓	C	S
Microlaena stipoides* var. *stipoides	Weeping Grass	✓	✓			✓	B	S,D
Panicum effusum	Hairy Panic					✓	C	S,(D)
***Poa labillardierei* (Volcanic Plains)**	Basalt Tussock-grass					✓+	E	S,(D)
Ptilotus macrocephalus	Feather Heads	✓	✓	✓	✓	✓	D	S
Ptilotus spathulatus f. spathulatus	Pussy Tails	✓	✓	✓	✓	✓	C	S
Rumex brownii	Slender Dock	✓	✓	✓	✓	✓	D	S
Rumex dumosus	Wiry Dock			✓	✓	✓	D	S
Senecio cunninghamii* var. *cunninghamii	Branching Groundsel	✓	✓	✓	✓	✓	D	S,C
Senecio hispidulus	Rough Groundsel	✓	✓			✓	D	S
Swainsona behriana	Southern Swainson-pea	✓	✓	✓	✓	✓	C	S
Templetonia stenophylla	Leafy Templetonia	✓	✓			✓	C	S

Species	Common Name	Vegetation Zones					Structural role of plant species	Propagation
		1	2	3	4	5		
Themeda triandra	Kangaroo Grass	✓	✓	✓	✓	✓	A	S
Vittadinia cervicularis	Annual New Holland Daisy	✓	✓			✓	C	S
Vittadinia cuneata* var. *cuneata	Fuzzy New Holland Daisy	✓	✓			✓	C	S
Vittadinia muelleri	Narrow-leaf New Holland Daisy	✓	✓				C	S
Wahlenbergia communis	Tufted Bluebell	✓	✓	✓	✓	✓	C	S,C,D
Wahlenbergia luteola	Bronze Bluebell	✓	✓	✓	✓	✓	C	S,C,D
Whalleya proluta	Rigid Panic			✓			C	S,(D)
Xerochrysum viscosum	Shiny Everlasting	✓	✓				C	S,(C)
Vines								
Clematis microphylla	Small-leaved Clematis	✓	✓	✓		✓	D	S,(C)
Mistletoes								
Amyema linophylla* subsp. *orientale	Buloke Mistletoe						E	B (host: *Allocasuarina luehmannii*)

Species	Common Name	Vegetation Zones					Structural role of plant species	Propagation
		1	2	3	4	5		
Amyema preissii	Wire-leaf Mistletoe	✓	✓			✓	E	B (host: *Acacia implexa*)
Lysiana exocarpi* subsp. *exocarpi	Harlequin Mistletoe	✓	✓			✓	E	B (host: *Allocasuarina verticillata*)

6.6.2 Revegetation methods and sources of propagating material

Revegetation methods

Three methods are generally used in revegetation exercises:

(i) direct seeding

(ii) planting of tubestock propagated from seeds (usually), cuttings, or divisions

(iii) facilitation of natural recruitment from naturally dispersed in situ or off-site sources of propagules (mostly seeds) on a suitable seed-bed.

Sources of propagating material

All revegetation should utilise indigenous species propagated from material (seeds, cuttings, divisions) obtained from the nearest *natural populations* locally or regionally, with the appropriate DSE permits and protocols to avoid harm to the source populations by overexploitation. All sources of material should be recorded by the contractor(s) or other parties involved in revegetation. Planted populations are unfortunately often unreliable as sources of material because much non-indigenous material is used in some sectors of the revegetation industry.

6.6.3 Revegetation zones

The revegetation zones are equivalent to the Plains Woodland, Plains Grassy Woodland, Low-rainfall *Themeda* grassland (with the unburnt and burnt sections grouped together) and Low-rainfall *Austrostipa-Austrodanthonia* grassland habitat zones at Bush's Paddock and the single habitat zone at Pinkerton Forest. It should be noted that Basalt Tussock-grass (*Poa labillardieri* (Volcanic Plains)) should only be planted in the drainage line in Zone 5 (*Austrostipa-Austrodanthonia* grassland).

6.6.4 Revegetation strategy

1. Weed control is an integral part of revegetation. Weed-control planning and revegetation planning must be closely integrated; revegetation is a component of the weed-control strategy.

2. The timing (season) of planting and the time required to produce the tubestock need to be adequately planned. The situation so common in revegetation exercises, whereby an opportunistic suite of tubestock species (often of mediocre or poor quality because 'overgrown') must be 'got rid of', that is planted, whatever the season and seasonal conditions, must be avoided.

3. A serious ongoing rabbit-control program must be devised as part of the revegetation program. Rabbit populations on the site have profound negative effects on indigenous vegetation.

6.6.5 Suitability of Fragrant Saltbush (*Rhagodia parabolica*) and Seaberry Saltbush (*Rhagodia candolleana* subsp. *candolleana*) for supplementary planting

Fragrant Saltbush (*Rhagodia parabolica*) is a natural component of the Plains (*Eucalyptus microcarpa*) Woodland at both Bush's Paddock and Pinkerton Forest. Although in Victoria it is confined to a relatively small area between Sunbury and Geelong, locally it is rather common. In fact, out of all 265 quadrats containing Grey Box (*Eucalyptus microcarpa*) south of the divide, it occurs in 14% of them. It would be beneficial to supplement the current populations of Fragrant Saltbush with propagated plants from locally sourced material.

Seaberry Saltbush (*Rhagodia candolleana* subsp. *candolleana*), as its name implies, is predominantly a coastal species found along the extent of the Victorian coastline. It is very abundant in plantations of Sugar Gums (*Eucalyptus cladocalyx*) on the Werribee Western Treatment Plant (Carr 1993); on the margins of some salt or brackish lakes on the Volcanic Plain; with a few pre-1900 records from much further inland (Mt Arapiles, Stawell, Wyperfeld National Park) (Walsh 1996). Its occurrence in the Plains (*Eucalyptus microcarpa*) Woodland at Pinkerton Forest can be thought of as a rare occurrence, probably the result of dispersal by a wide-ranging frugivore. Unlike Fragrant Saltbush, it would not be a common natural component of the woodland and does not occur in any of the quadrats containing Grey Box (*Eucalyptus microcarpa*) south of the divide. We exclude it as a legitimate member of the indigenous flora, and in any event Fragrant Saltbush fulfils all faunal habitat functions attributable to Seaberry Saltbush (e.g. cover for small birds, fruits as a source of food for birds).

6.7 Fauna reintroduction

The Bush Stone-curlew was once widespread in southern Victoria, but is now effectively extinct south of the Great Dividing Range (Emison et al. 1987), and definitely extinct in the Melton region (Hewish et al. 2006). Populations in northern Victoria are apparently also decreasing, with the most recent estimate suggesting fewer than 200 birds remaining in Victoria (Johnson and Baker-Gabb 1994; Webster and Baker-Gabb 1993). Though there have been occasional records of single birds in the greater Port Phillip region over the last few decades, Bush Stone-curlews have been functionally extinct in the region since the 1970s (Hewish et al. 2006; Pescott 1983).

The species is regarded as Near Threatened in Australia (Garnett and Crowley 2000), Endangered in Victoria (DSE 2003b), and is a listed threatened species under the Victorian *Flora and Fauna Guarantee Act 1988*.

Bush Stone-curlews typically inhabit open forest or woodland with a sparse grassy ground cover (Garnett and Crowley 2000). The most significant threatening process for this species is probably predation by foxes, followed by habitat loss and degradation (Johnson and Baker-Gabb 1994). Removal of woody debris from woodlands (often for firewood) is thought to be an important degrading process for stone-curlews.

Anecdotal evidence suggests that pairs require a breeding territory of 10-20 hectares (Schodde and Mason 1980), or as much as 25 hectares (Marchant and Higgins 1993). In the non-breeding season

birds move around a loose diurnal home-range which may be as large as 250 hectares *per bird*, but it is thought that the nocturnal home-range may be much larger (Johnson and Baker-Gabb 1994).

The Bush Stone-curlew is not a good candidate for reintroduction to Pinkerton Forest and Bush's Paddock, for the following reasons:

- The species has become extinct throughout southern Victoria in the second half of the 20th century, and the threatening processes (not all are known) continue to operate;
- The birds require a relatively large breeding range and a very large home-range, of which the combined Pinkerton Forest/Bush's Paddock would supply at best only about 20% of area requirements;
- Foxes are a significant predator, and cannot be easily controlled over a large, unfenced area;
- Predator-proof fencing of Pinkerton Forest/Bush's Paddock would be prohibitively expensive, but the birds range so widely that they would be likely to spend much of their time outside the predator-proof fence;
- The demographic and genetic viability of a reintroduced Bush Stone-curlew population would require that a large number of pairs be established in secure and suitable habitat across the wider Melton – Bacchus Marsh district (and perhaps more widely), and this seems both impractical and unlikely to succeed.

Recommendations:

1. We recommend that the Bush Stone-curlew should **not** be reintroduced to Pinkerton Forest/Bush's Paddock.
2. The most important fauna conservation priorities for Pinkerton Forest/Bush's Paddock should be to protect and enhance the existing populations of threatened woodland birds, such as Diamond Firetail, Jacky Winter and Brown Treecreeper.
3. Once a middle-storey layer of *Acacia*, and other shrubs and smaller trees, has been established in Pinkerton Forest/Bush's Paddock, we recommend that reintroduction of the Sugar Glider *Petaurus breviceps* be contemplated as an option. This species has been successfully reintroduced elsewhere in Victoria (e.g. Tower Hill), and would be likely to be successful at Pinkerton Forest/Bush's Paddock.

7 Recommendations

The following recommendations are made:

1 Plan a detailed 5-year, area-by-area revegetation program as a corollary to weed management activities. Ensure appropriate lead-times for contractor to produce tubestock for the revegetation program.

2 Revegetation should include Fragrant Saltbush (*Rhagodia parabolica*) but not Seaberry Saltbush (*Rhagodia candolleana*). Fragrant Saltbush occurs naturally in Grey Box vegetation of the region, whereas Seaberry Saltbush is coastal, or rarely subcoastal. It has however become very abundant in Sugar Gum (#*Eucalyptus cladocalyx*) plantations at Werribee Treatment Plant complex.

3 Sheep grazing should be used for biomass recution at a frequency and timing to be resolved.

4 Ensure all aspects of management (weed control, revegetation, rabbit control etc.) are adequately documented as a permanent record. Include the provenance of all material used for revegetation and enrichment planting.

5 Continue the regular bird surveys by the Bird Observers Club of Victoria, but attempt to target survey effort more evenly amongst the months and seasons, in order to provide more temporally representative sampling.

6 Survey for and ensure clear marking of the remnant indigenous flora (mostly individuals or small populations of plant species) to protect plants during weed management activities.

7 Ensure monitoring protocols are in place to keep track of weed control and revegetation exercises and to identify management requirements in a timely fashion.

8 It is essential to devise and implement a rabbit control program.

9 Cease irrigation of woodlands with wastewater because of potential to alter hydrology, increase nutrients in the soil and exacerbate weed invasion.

10 Build a rabbit proof fence around Bush's Paddock.

11 Survey outside the fenced area of Pinkerton Forest to locate all Werribee Blue Box (*Eucalyptus* sp. aff. *baueriana* (Werribee)) at Surbiton Park. These should be incorporated in the fenced area of Pinkerton Forest, as appropriate.

12 Seed should be collected from all plants of Werribee Blue Box and placed in a seed bank, for instance at the Royal Botanic Gardens and by the Pinkerton Landcare and Environment Group, and used for revegetation.

13 Surveys for Golden Sun Moth could be undertaken in the grassland habitats during the appropriate season (e.g. roughly between mid to late November and early January).

14 A supplementary flora survey should be conducted in Spring of 2007 assuming reasonable rainfall to confirm the existence of some of the species recorded and record additional species.

15 Consider supplementing the stock of logs in the ground in both patches (from outside sources), particularly in Bush's Paddock.

16 We recommend that the Bush Stone-curlew should **not** be reintroduced to Pinkerton Forest/Bush's Paddock.

17 The most important fauna conservation priorities for Pinkerton Forest/Bush's Paddock should be to protect and enhance the existing populations of threatened woodland birds, such as Diamond Firetail, Jacky Winter and Brown Treecreeper.

18 Once a middle-storey layer of *Acacia*, and other shrubs and smaller trees, has been established in Pinkerton Forest/Bush's Paddock, we recommend that reintroduction of the Sugar Glider *Petaurus breviceps* be contemplated as an option. This species has been successfully reintroduced elsewhere in Victoria (e.g. Tower Hill), and would be likely to be successful at Pinkerton Forest/Bush's Paddock.

19 Maintain and enhance existing habitat links between Eynesbury and Pinkerton Forest and Bush's Paddock to enhance fauna movement between the areas.

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Appendix 1 Plant species list recorded at Bush's Paddock during current survey

MONOCOTYLEDONS

Cyperaceae

	Carex inversa	Knob Sedge
*	***Cyperus eragrostis***	Drain Flat-sedge
	Eleocharis acuta	Common Spike-sedge

Iridaceae

*	***Romulea rosea var. australis s.s.***	Common Onion-grass

Juncaceae

	Juncus bufonius	Toad Rush
	Juncus flavidus	Gold Rush
	Juncus subsecundus	Finger Rush

Phormiaceae

	Caesia calliantha	Blue Grass-lily
	Dianella admixta	Black-anther Flax-lily
v	***Dianella sp. aff. longifolia (Benambra)***	Arching Flax-lily
	Tricoryne elatior	Yellow Rush-lily

Poaceae

*	***Aira spp.***	Hair Grass
	Austrodanthonia auriculata	Lobed Wallaby-grass
	Austrodanthonia caespitosa	Common Wallaby-grass
	Austrodanthonia carphoides	Short Wallaby-grass
	Austrodanthonia fulva	Copper-awned Wallaby-grass
	Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass
	Austrodanthonia setacea	Bristly Wallaby-grass
	Austrodanthonia spp.	Wallaby Grass
	Austrostipa bigeniculata	Kneed Spear-grass
	Austrostipa densiflora	Dense Spear-grass
	Austrostipa gibbosa	Spurred Spear-grass
r	***Austrostipa hemipogon***	Half-bearded Spear-grass

	Austrostipa mollis	Supple Spear-grass
	Austrostipa oligostachya	Fine-head Spear-grass
	Austrostipa scabra	Rough Spear-grass
	Austrostipa semibarbata	Fibrous Spear-grass
	Austrostipa spp.	Spear Grass
*	***Avena barbata***	Bearded Oat
*	***Briza maxima***	Large Quaking-grass
*	***Briza minor***	Lesser Quaking-grass
*	***Bromus catharticus***	Prairie Grass
*	***Bromus diandrus***	Great Brome
*	***Bromus hordeaceus subsp. hordeaceus***	Soft Brome
	Chloris truncata	Windmill Grass
	Cynodon dactylon	Couch
*	***Cynodon dactylon var. dactylon***	Couch
*	***Cynosurus echinatus***	Rough Dog's-tail
*	***Dactylis glomerata***	Cocksfoot
	Dichelachne crinita	Long-hair Plume-grass
*	***Ehrharta erecta var. erecta***	Panic Veldt-grass
*	***Ehrharta longiflora***	Annual Veldt-grass
*	***Holcus lanatus***	Yorkshire Fog
*	***Hordeum murinum s.l.***	Barley-grass
	Lachnagrostis filiformis	Common Blown-grass
*	***Lolium rigidum***	Wimmera Rye-grass
*	***Lolium spp.***	Rye Grass
	Microlaena stipoides var. stipoides	Weeping Grass
*	***Nassella neesiana***	Chilean Needle-grass
*	***Nassella trichotoma***	Serrated Tussock
*	***Paspalum dilatatum***	Paspalum
*	***Pentaschistis airoides subsp. airoides***	False Hair-grass
*	***Phalaris aquatica***	Toowoomba Canary-grass
*	***Polypogon monspeliensis***	Annual Beard-grass

Themeda triandra	Kangaroo Grass
* ***Tribolium acutiflorum s.l.***	Desmazeria
* ***Vulpia spp.***	Fescue
Whalleya proluta	Rigid Panic
Potamogetonaceae	
Potamogeton cheesemanii	Red Pondweed
Potamogeton ochreatus	Blunt Pondweed
Potamogeton pectinatus	Fennel Pondweed
Typhaceae	
Typha orientalis	Broad-leaf Cumbungi
Xanthorrhoeaceae	
Lomandra filiformis	Wattle Mat-rush
DICOTYLEDONS	
Aizoaceae	
* ***Galenia pubescens var. pubescens***	Galenia
Amaranthaceae	
Alternanthera denticulata s.s.	Lesser Joyweed
* ***Amaranthus muricatus***	Rough-fruit Amaranth
Ptilotus macrocephalus	Feather Heads
Apiaceae	
Eryngium ovinum	Blue Devil
Asteraceae	
* ***Arctotheca calendula***	Cape Weed
Calocephalus citreus	Lemon Beauty-heads
Cassinia arcuata	Drooping Cassinia
* ***Cirsium vulgare***	Spear Thistle
* ***Conyza sumatrensis***	Tall Fleabane
* ***Cynara cardunculus***	Spanish Artichoke
* ***Gamochaeta purpurea s.s.***	Spiked Cudweed
* ***Helminthotheca echioides***	Ox-tongue
* ***Hypochoeris radicata***	Cat's Ear

*	***Lactuca serriola***	Prickly Lettuce
*	***Leontodon taraxacoides subsp. taraxacoides***	Hairy Hawkbit
	Pseudognaphalium luteoalbum	Jersey Cudweed
	Senecio quadridentatus	Cotton Fireweed
*	***Sonchus asper s.l.***	Rough Sow-thistle
*	***Sonchus oleraceus***	Common Sow-thistle
Brassicaceae		
*	***Brassica fruticulosa***	Twiggy Turnip
*	***Lepidium africanum***	Common Peppercress
*	***Rapistrum rugosum***	Giant Mustard
Caryophyllaceae		
*	***Polycarpon tetraphyllum***	Four-leaved Allseed
Casuarinaceae		
	Allocasuarina verticillata	Drooping Sheoak
Chenopodiaceae		
	Atriplex semibaccata	Berry Saltbush
*	***Chenopodium murale***	Sowbane
	Chenopodium pumilio	Clammy Goosefoot
	Einadia nutans subsp. nutans	Nodding Saltbush
	Enchylaena tomentosa var. tomentosa	Ruby Saltbush
	Maireana enchylaenoides	Wingless Bluebush
r	***Rhagodia parabolica***	Fragrant Saltbush
Convolvulaceae		
k	***Convolvulus angustissimus subsp. omnigracilis***	Slender Bindweed
	Dichondra repens	Kidney-weed
Crassulaceae		
	Crassula closiana	Stalked Crassula
	Crassula helmsii	Swamp Crassula
Fabaceae		
*	***Trifolium subterraneum***	Subterranean Clover
*	***Vicia sativa subsp. sativa***	Common Vetch

Gentianaceae	
* ***Centaurium tenuiflorum***	Slender Centaury
Geraniaceae	
* ***Erodium botrys***	Big Heron's-bill
Geranium spp.	Crane's Bill
Lamiaceae	
* ***Marrubium vulgare***	Horehound
Mentha satureoides	Creeping mint
Lythraceae	
Lythrum hyssopifolia	Small Loosestrife
Mimosaceae	
Acacia acinacea s.l.	Gold-dust Wattle
Acacia implexa	Lightwood
Acacia pycnantha	Golden Wattle
Myoporaceae	
Eremophila deserti	Turkey Bush
Myrtaceae	
Eucalyptus camaldulensis	River Red-gum
* ***Eucalyptus cladocalyx***	Sugar Gum
Eucalyptus melliodora	Yellow Box
Eucalyptus microcarpa	Grey Box
Onagraceae	
Epilobium hirtigerum	Hairy Willow-herb
Oxalidaceae	
Oxalis perennans	Grassland Wood-sorrel
Pittosporaceae	
Bursaria spinosa subsp. spinosa	Sweet Bursaria
Plantaginaceae	
* ***Plantago lanceolata***	Ribwort
Polygonaceae	
* ***Acetosella vulgaris***	Sheep Sorrel

* ***Polygonum aviculare s.l.***	Prostrate Knotweed
Rumex brownii	Slender Dock
* ***Rumex conglomeratus***	Clustered Dock
* ***Rumex crispus***	Curled Dock
Rumex dumosus	Wiry Dock
Ranunculaceae	
Clematis microphylla	Small-leaved Clematis
Rosaceae	
* ***Prunus cerasifera***	Cherry Plum
* ***Rosa rubiginosa***	Sweet Briar
Rubus spp.	Bramble
Solanaceae	
* ***Lycium ferocissimum***	African Box-thorn
* ***Physalis viscosa***	Sticky Ground-cherry
Stackhousiaceae	
Stackhousia sp. 1	Plains Stackhousia
Violaceae	
Melicytus dentatus s.s.	Tree Violet
Melicytus sp. aff. dentatus (Volcanic Plain variant)	Tangled Shrub-violet

Appendix 2 Plant species list recorded at Pinkerton Forest during current survey

MONOCOTYLEDONS		
Cyperaceae		
	Carex inversa	Knob Sedge
*	***Cyperus eragrostis***	Drain Flat-sedge
Iridaceae		
*	***Romulea minutiflora***	Small-flower Onion-grass
*	***Romulea rosea var. australis s.s.***	Common Onion-grass
Juncaceae		
	Juncus flavidus	Gold Rush
	Juncus subsecundus	Finger Rush
Phormiaceae		
v	***Dianella sp. aff. longifolia (Benambra)***	Arching Flax-lily
Poaceae		
	Austrodanthonia caespitosa	Common Wallaby-grass
	Austrodanthonia fulva	Copper-awned Wallaby-grass
	Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass
	Austrodanthonia setacea	Bristly Wallaby-grass
	Austrodanthonia spp.	Wallaby Grass
	Austrostipa bigeniculata	Kneed Spear-grass
	Austrostipa gibbosa	Spurred Spear-grass
r	***Austrostipa hemipogon***	Half-bearded Spear-grass
	Austrostipa scabra	Rough Spear-grass
	Austrostipa spp.	Spear Grass
*	***Avena spp.***	Oat
*	***Bromus diandrus***	Great Brome
*	***Ehrharta longiflora***	Annual Veldt-grass
*	***Hordeum murinum s.l.***	Barley-grass
*	***Lolium rigidum***	Wimmera Rye-grass

*	***Nassella trichotoma***	Serrated Tussock
Xanthorrhoeaceae		
	Lomandra filiformis	Wattle Mat-rush
	Lomandra micrantha s.l.	Small-flower Mat-rush
DICOTYLEDONS		
Aizoaceae		
*	***Galenia pubescens var. pubescens***	Galenia
Chenopodiaceae		
	Atriplex semibaccata	Berry Saltbush
	Chenopodium desertorum	Frosted Goosefoot
*	***Chenopodium murale***	Sowbane
	Einadia nutans subsp. nutans	Nodding Saltbush
	Enchylaena tomentosa var. tomentosa	Ruby Saltbush
	Maireana enchylaenoides	Wingless Bluebush
	Rhagodia candolleana subsp. candolleana	Seaberry Saltbush
r	***Rhagodia parabolica***	Fragrant Saltbush
Convolvulaceae		
	Dichondra repens	Kidney-weed
Crassulaceae		
	Crassula tetramera	Australian Stonecrop
Fabaceae		
f Vv	***Glycine latrobeana***	Clover Glycine
Lamiaceae		
*	***Marrubium vulgare***	Horehound
Mimosaceae		
	Acacia acinacea s.l.	Gold-dust Wattle
	Acacia pycnantha	Golden Wattle
Myrtaceae		
	***Eucalyptus* aff. *baueriana* (Werribee River Catchment)**	Werribee Blue Box
	Eucalyptus melliodora	Yellow Box
	Eucalyptus microcarpa	Grey Box

Onagraceae	
Epilobium hirtigerum	Hairy Willow-herb
Pittosporaceae	
Bursaria spinosa subsp. spinosa	Sweet Bursaria
Ranunculaceae	
Clematis microphylla	Small-leaved Clematis
Solanaceae	
**** Lycium ferocissimum***	African Box-thorn
Violaceae	
Melicytus dentatus s.s.	Tree Violet

Appendix 3 Plant species list recorded at Bush's Paddock and Pinkerton Forest from previous formal surveys on Bush's Paddock and Pinkerton Forest by Frood et al. (2003) (DF 2003) and Tim D'Ombrian (2001) (TDO 2001) as well as the results of this study (EA 2006) and informal records kept by Pinkerton Landcare and Environment Group (PLEG).

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
				Acacia acinacea	Gold-dust Wattle	Mimosaceae	x				x	
				Acacia implexa	Lightwood	Mimosaceae	x	x	x	x		
				Acacia paradoxa	Hedge Wattle	Mimosaceae		x	x	x		
				Acacia pycnantha	Golden Wattle	Mimosaceae	x				x	
				Acaena echinata	Sheep's Burr	Rosaceae		x	x			
				Acaena sp.	Sheep's Burr	Rosaceae		x		x		
			*	*Acetosella vulgaris*	Sheep Sorrel	Polygonaceae	x	x	x			
			*	*Aira caryophyllea*	Silvery Hair Grass	Poaceae		x	x			
			*	*Aira sp.*	Hair Grass	Poaceae	x					
				Allocasuarina verticillata	Drooping Sheoak	Casuarinaceae	x	x	x	x		
				Alternanthera denticulata s.s.	Lesser Joyweed	Amaranthaceae	x					
			*	*Amaranthus muricatus*	Rough-fruit Amaranth	Amaranthaceae	x					
				Amphibromus nervosus	Common Swamp Wallaby-grass	Poaceae		x				
			*	*Arctotheca calendula*	Cape Weed	Asteraceae	x	x				
				Arthropodium strictum	Chocolate-lily	Antheriaceae			x	x		
				Asperula conferta	Common Woodruff	Rubiaceae		x				
			*	*Aster subulatus*	Aster-weed	Poaceae		x				
				Atriplex semibaccata	Berry Saltbush	Chenopodiaceae	x	x	x		x	

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
				Austrodanthonia auriculata	Lobed Wallaby-grass	Poaceae	x	x				
				Austrodanthonia caespitosa	Common Wallaby-grass	Poaceae	x	x			x	
				Austrodanthonia carphoides	Short Wallaby-grass	Poaceae	x	x				
				Austrodanthonia duttoniana	Brown-back Wallaby-grass	Poaceae		x				
				Austrodanthonia eriantha	Hill Wallaby-grass	Poaceae		x				
				Austrodanthonia fulva	Copper-awned Wallaby-grass	Poaceae	x	x			x	
				Austrodanthonia pilosa	Velvet Wallaby-grass	Poaceae		x				
				Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass	Poaceae	x	x			x	
				Austrodanthonia setacea	Bristly Wallaby-grass	Poaceae	x	x		x	x	
				Austrodanthonia sp.	Wallaby Grass	Poaceae	x	x		x	x	
				Austrostipa aristiglumis	Plump Spear-grass	Poaceae		x				
				Austrostipa bigeniculata	Kneed Spear-grass	Poaceae	x				x	
				Austrostipa blackii	Crested Spear-grass	Poaceae		x?				
				Austrostipa curticoma	Short-crown Spear-grass	Poaceae		x				
				Austrostipa densiflora	Dense Spear-grass	Poaceae	x					
				Austrostipa exilis	Heath Spear-grass	Poaceae				x		x
				Austrostipa gibbosa	Spurred Spear-grass	Poaceae	x	x		x	x	
		r		*Austrostipa hemipogon*	Half-bearded Spear-grass	Poaceae	x				x	

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
				Austrostipa mollis	Supple Spear-grass	Poaceae	x	x				
				Austrostipa oligostachya	Fine-head Spear-grass	Poaceae	x					
				Austrostipa scabra	Rough Spear-grass	Poaceae	x	x			x	
				Austrostipa semibarbata	Fibrous Spear-grass	Poaceae	x	x				
				Austrostipa setacea	Corkscrew Spear-grass	Poaceae		x				
				Austrostipa sp.	Spear Grass	Poaceae	x	x		x	x	
			*	*Avena barbata*	Bearded Oat	Poaceae	x	x	x		x	
				Bothriocloa macra	Red-leg Grass	Poaceae		x?				x
			*	*Brassica fruticulosa*	Twiggy Turnip	Brassicaceae	x					
			*	*Briza maxima*	Large Quaking-grass	Poaceae	x	x	x			
			*	*Briza minor*	Lesser Quaking-grass	Poaceae	x	x				
			*	*Bromus catharticus*	Prairie Grass	Poaceae	x					
			*	*Bromus diandrus*	Great Brome	Poaceae	x	x			x	
			*	*Bromus hordeaceus subsp. hordeaceus*	Soft Brome	Poaceae	x	x				
			*	*Bromus rubens*	Red Brome	Poaceae		x				
				Bursaria spinosa subsp. spinosa	Sweet Bursaria	Pittosporaceae	x	x	x		x	
				Caesia calliantha	Blue Grass-lily	Phormiaceae	x					
				Calocephalus citreus	Lemon Beauty-heads	Asteraceae	x	x	x	x		
				Calotis scabiosifolia var. scabiosifolia	Rough Burr-daisy	Asteraceae				x		
				Carex inversa s.l.	Knob Sedge	Cyperaceae	x	x			x	

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
				Cassinia arcuata	Drooping Cassinia	Asteraceae	x					
			*	*Centaurium tenuiflorum*	Slender Centaury	Gentianaceae	x					
			*	*Chamaecytisus palmensis*	Tree Lucerne	Fabaceae		x	x			
				Chamaesyce drummondii	Flat Spurge	Euphorbiaceae		x				
				Cheilanthes sieberi	Narrow Rock-fern	Adiantaceae		x				
				Chenopodium desertorum subsp. microphyllum	Frosted Goosefoot	Chenopodiaceae					x	
			*	*Chenopodium murale*	Sowbane	Chenopodiaceae	x				x	
				Chenopodium pumilio	Clammy Goosefoot	Chenopodiaceae	x					
				Chloris truncata	Windmill Grass	Poaceae	x	x	x			
				Chrysocephalum apiculatum s.l.	Common Everlasting	Asteraceae		x	x	x		
			*	*Cirsium vulgare*	Spear Thistle	Asteraceae	x	x	x			
				Clematis microphylla	Small-leaved Clematis	Ranunculaceae	x	x	x	x	x	
		k		*Convolvulus angustissimus subsp. omnigracilis*	Slender Bindweed	Convolvulaceae	x	x	x	x		
			*	*Conyza sumatrensis*	Tall Fleabane	Asteraceae	x					
				Crassula closiana	Stalked Crassula	Crassulaceae	x					
				Crassula helmsii	Swamp Crassula	Crassulaceae	x					
				Crassula sieberiana	Sieber Crassula	Crassulaceae		x				
				Crassula tetramera	Australian Stonecrop	Crassulaceae					x	
			*	*Critesion murimum subsp. glaucum*	Blue Barley-grass	Poaceae		x				
				Cucumis myriocarpus	Paddy Melon	Cucurbitaceae		x	x			
			*	*Cynara cardunculus*	Spanish Artichoke	Asteraceae	x	x	x			

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
			*	*Cynodon dactylon var. dactylon*	Couch	Poaceae	x					
			*	*Cynosurus echinatus*	Rough Dog's-tail	Poaceae	x	x	x			
			*	*Cyperus eragrostis*	Drain Flat-sedge	Cyperaceae	x	x			x	
			*	*Dactylis glomerata*	Cocksfoot	Poaceae	x	x				
				Dianella admixta	Black-anther Flax-lily	Phormiaceae	x					
		v		*Dianella sp. aff. longifolia* (Benambra)	Arching Flax-lily	Phormiaceae	x	x	x	x	x	
				Dichelachne crinita	Long-hair Plume-grass	Poaceae	x			x		
				Dichondra repens	Kidney-weed	Convolvulaceae	x	x	x		x	
f	E	v		*Diuris sp. aff. chryseopsis* (Basalt Plains)	Small Golden Moths	Orchidaceae				x?		
				Drosera peltata	Pale Sundew	Droseraceae		x	x	x		
			*	*Ehrharta erecta var. erecta*	Panic Veldt-grass	Poaceae	x	x				
			*	*Ehrharta longiflora*	Annual Veldt-grass	Poaceae	x	x			x	
				Einadia nutans subsp. nutans	Nodding Saltbush	Chenopodiaceae	x	x	x	x	x	x
				Eleocharis acuta	Common Spike-sedge	Cyperaceae	x	x				
				Eleocharis pusilla	Small Spike-sedge	Cyperaceae		x				
				Elymus scaber var. scaber	Common Wheat-grass	Poaceae		x				
				Enchylaena tomentosa var. tomentosa (prostrate form)	Ruby Saltbush	Chenopodiaceae	x				x	
				Enchylaena tomentosa var. tomentosa (shrubby	Ruby Saltbush	Chenopodiaceae					x	

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
				form)								
				Epilobium billardierianum	Robust Willow-herb	Onagraceae		x	x			
				Epilobium hirtigerum	Hairy Willow-herb	Onagraceae	x	x			x	
				Eremophila deserti	Turkey Bush	Myoporaceae	x	x	x			
			*	*Erodium botrys*	Big Heron's-bill	Geraniaceae	x	x	x			
				Eryngium ovinum	Blue Devil	Apiaceae	x	x	x	x		
				Eucalyptus aff. *baueriana* (Werribee River Catchment)	Werribee Blue Box	Myrtaceae					x	
				Eucalyptus camaldulensis	River Red-gum	Myrtaceae	x	x	x	x		
			*	*Eucalyptus cladocalyx*	Sugar Gum	Myrtaceae	x					
				Eucalyptus melliodora	Yellow Box	Myrtaceae	x	x	x		x	
				Eucalyptus microcarpa	Grey Box	Myrtaceae	x	x	x	x	x	x
				Euchiton collinus	Creeping Cudweed	Asteraceae		x	x			
				Euchiton sphaericus	Annual Cudweed	Asteraceae		x				
			*	*Galenia pubescens var. pubescens*	Galenia	Aizoaceae	x	x	x		x	
				Galium migrans	Wandering Bedstraw	Rubiaceae		x				
			*	*Gamochaeta purpurea s.s.*	Spiked Cudweed	Asteraceae	x	x				
				Geranium retrorsum	Grassland Cranesbill	Geraniaceae		x	x	x		
				Geranium sp.	Crane's Bill	Geraniaceae	x	x		x		
f	V	v		*Glycine latrobeana*	Clover Glycine	Fabaceae					x	
			*	*Helminthotheca echioides*	Ox-tongue	Asteraceae	x	x				
			*	*Holcus lanatus*	Yorkshire Fog	Poaceae	x	x				

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
			*	*Hordeum murinum s.l.*	Barley-grass	Poaceae	x				x	
				Hypericum gramineum	Small St John's Wort	Clusiaceae		x	x			
			*	*Hypochoeris glabra*	Smooth Cat's Ear	Asteraceae		x				
			*	*Hypochoeris radicata*	Cat's Ear	Asteraceae	x	x				
				Juncus bufonius	Toad Rush	Juncaceae	x					
				Juncus filicaulis	Thread Rush	Juncaceae		x	x			
				Juncus flavidus	Gold Rush	Juncaceae	x	x	x		x	
				Juncus radula	Hoary Rush	Juncaceae		x				
				Juncus subsecundus	Finger Rush	Juncaceae	x	x		x	x	
				Lachnagrostis filiformis	Common Blown-grass	Poaceae	x	x				
			*	*Lactuca serriola*	Prickly Lettuce	Asteraceae	x					
			*	*Leontodon taraxacoides subsp. taraxacoides*	Hairy Hawkbit	Asteraceae	x	x				
			*	*Lepidium africanum*	Common Peppercress	Brassicaceae	x	x	x			
			*	*Lolium rigidum*	Wimmera Rye-grass	Poaceae	x	x	x		x	
				Lomandra filiformis subsp. coriacea	Wattle Mat-Rush	Xanthorrhoeaceae		x				
				Lomandra filiformis subsp. filiformis	Wattle Mat-Rush	Xanthorrhoeaceae		x				
				Lomandra filiformis s.l.	Wattle Mat-rush	Xanthorrhoeaceae	x		x	x	x	
				Lomandra micrantha subsp. micrantha	Small-flower Mat-rush	Xanthorrhoeaceae					x	
				Lomandra nana	Dwarf Mat-rush	Xanthorrhoeaceae		x	x			
			*	*Lycium ferocissimum*	African Box-thorn	Solanaceae	x	x	x		x	x

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
				Lythrum hyssopifolia	Small Loosestrife	Lythraceae	x	x	x			
				Maireana enchylaenoides	Wingless Bluebush	Chenopodiaceae	x	x		x	x	
			*	*Marrubium vulgare*	Horehound	Lamiaceae	x	x	x		x	
				Melicytus dentatus s.s.	Tree Violet	Violaceae	x	x	x	x	x	
				Melicytus sp. aff. dentatus (Volcanic Plain variant)	Tangled Shrub-violet	Violaceae	x	x		x		
			*	*Medicago polymorpha*	Burr Medic	Fabaceae		x				
				Mentha satureoides	Creeping mint	Lamiaceae	x			x		
				Microlaena stipoides var. stipoides	Weeping Grass	Poaceae	x	x	x	x		
			*	*Nassella neesiana*	Chilean Needle-grass	Poaceae	x	x	x		x	
			*	*Nassella trichotoma*	Serrated Tussock	Poaceae	x	x	x			x
			*	*Opuntia ficus-indica*	Indian Fig	Cactaceae	x					
				Oxalis exilis	Shady Wood-sorrel	Oxalidaceae		x				
				Oxalis perennans	Grassland Wood-sorrel	Oxalidaceae	x	x	x	x		
				Panicum decompositum	Australian Millet	Poaceae		x?				
				Panicum effusum	Hairy Panic	Poaceae		x				
			*	*Paspalum dilatatum*	Paspalum	Poaceae	x					
			*	*Paspalum distichum*	Water Couch	Poaceae		x				
				Pelargonium rodneyanum	Magenta Stork's-bill	Geraniaceae		x		x		
			*	*Pentaschistis airoides subsp. airoides*	False Hair-grass	Poaceae	x	x				
				Persicaria prostrata	Creeping Knotweed	Polygonaceae		x				
			*	*Phalaris aquatica*	Toowoomba Canary-grass	Poaceae	x					

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
			*	*Phalaris paradoxa*	Paradoxical Canary-grass	Poaceae		x				
			*	*Physalis viscosa*	Sticky Ground-cherry	Solanaceae	x	x	x			x
			*	*Phytolacca octandra*	Red-ink Weed	Phytolaccaceae		x	x			
				Pimelea curviflora	Curved Rice-flower	Thymelaeaceae		x				
				Pimelea glauca	Smooth Rice-flower	Thymelaeaceae	x	x	x	x		
			*	*Plantago lanceolata*	Ribwort	Plantaginaceae	x	x				
			*	*Poa annua*	Annual Meadow-grass	Poaceae		x				
				Poa morrissii	Soft Tussock-grass	Poaceae		x				
			*	*Polycarpon tetraphyllum*	Four-leaved Allseed	Caryophyllaceae	x					
			*	*Polygonum aviculare s.l.*	Prostrate Knotweed	Polygonaceae	x					
			*	*Polypogon monspeliensis*	Annual Beard-grass	Poaceae	x					
				Potamogeton cheesemanii	Red Pondweed	Potamogetonaceae	x					
				Potamogeton ochreatus	Blunt Pondweed	Potamogetonaceae	x					
				Potamogeton pectinatus	Fennel Pondweed	Potamogetonaceae	x					
				Potamogeton tricarinatus	Floating Pondweed	Potamogetonaceae		x	x			
			*	*Prunus cerasifera*	Cherry Plum	Rosaceae	x					
				Pseudognaphalium luteoalbum	Jersey Cudweed	Asteraceae	x	x	x	x		
				Ptilotus macrocephalus	Feather Heads	Amaranthaceae	x	x	x	x		
			*	*Rapistrum rugosum*	Giant Mustard	Brassicaceae	x					
				Rhagodia candolleana subsp. candolleana	Seaberry Saltbush	Chenopodiaceae					x	
		r		*Rhagodia parabolica*	Fragrant Saltbush	Chenopodiaceae	x				x	

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
			*	*Romulea minutiflora*	Small-flower Onion-grass	Iridaceae					x	
			*	*Romulea rosea var. australis s.s.*	Common Onion-grass	Iridaceae	x	x	x		x	
			*	*Rosa rubiginosa*	Sweet Briar	Rosaceae	x	x	x			
			*	*Rubus fruticosus* spp. agg.	Bramble	Rosaceae	x					
				Rumex brownii	Slender Dock	Polygonaceae	x	x				
			*	*Rumex conglomeratus*	Clustered Dock	Polygonaceae	x					
			*	*Rumex crispus*	Curled Dock	Polygonaceae	x	x				
				Rumex dumosus	Wiry Dock	Polygonaceae	x	x	x	x		
				Shoenus apogon	Common Bog-sedge	Cyperaceae		x				
				Senecio quadridentatus	Cotton Fireweed	Asteraceae	x					
			*	*Silybum marianum*	Variegated Thistle	Asteraceae		x				
			*	*Solanum linneanum*	Apple of Sodom	Solanaceae		x	x			
			*	*Solanum nigrum*	Black Nightshade	Solanaceae		x	x			
			*	*Sonchus asper s.l.*	Rough Sow-thistle	Asteraceae	x	x				
			*	*Sonchus oleraceus*	Common Sow-thistle	Asteraceae	x	x	x			
				Stackhousia sp. 1	Plains Stackhousia	Stackhousiaceae	x	x	x	x		
				Themeda triandra	Kangaroo Grass	Poaceae	x	x	x	x		x
			*	*Tribolium acutiflorum s.l.*	Desmazeria	Poaceae	x					
				Tricoryne elatior	Yellow Rush-lily	Phormiaceae	x	x		x		
			*	*Trifolium arvense*	Hare's-foot Clover	Fabaceae		x				
			*	*Trifolium dubium*	Suckling Clover	Fabaceae		x	x			
				Trifolium glomeratum	Cluster Clover	Fabaceae		x				

							BUSH'S PADDOCK				PINKERTON FOREST	
FFG	**EPBC**	**VROTS**		***Scientific Name***	**Common Name**	**Family Name**	**EA 2006**	**DF 2003**	**TDO 2001**	**PLEG**	**EA 2006**	**PLEG**
			*	*Trifolium subterraneum*	Subterranean Clover	Fabaceae	x	x				
				Typha orientalis	Broad-leaf Cumbungi	Typhaceae	x					
			*	*Verbascum thapsus*	Great Mullein	Scrophulariaceae		x	x			
			*	*Vicia sativa subsp. sativa*	Common Vetch	Fabaceae	x					
			*	*Vulpia bromoides*	Squirrel-tail Fescue	Poaceae	x	x	x			
			*	*Vulpia myorus forma myorus*	Rat's-tail Fescue	Poaceae		x				
			*	*Xanthium spinosum*	Bathurst Burr	Asteraceae		x	x			
				Xerochrysum viscosum	Shiny Everlasting	Asteraceae				x		
				Whalleya proluta	Rigid Panic	Poaceae	x					

Appendix 4 Plant species list recorded at Bush's Paddock and Pinkerton Forest from all previous surveys showing Ecological Vegetation Classes in which they were found

LEGEND
PW 803: Plains Woodland EVC 803
PGW 55_61: Plains Grassy Woodland EVC 55_61
LRfPG 132_65: Low rainfall Plains Grassland EVC 132_65
FS: Fenceline Shrubland (no EVC)
WF: Wetland formation (no EVC)
PG: Planted Garden (no EVC)
Y: found in this EVC
R: found on adjacent road verge

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
Acacia acinacea	Gold-dust Wattle		Y									Y
Acacia implexa	Lightwood							Y				
Acacia paradoxa	Hedge Wattle							Y				
Acacia pycnantha	Golden Wattle		Y									Y
Acaena echinata	Sheep's Burr		Y		Y							
Acaena sp. *(ovina/agnipila)*	Sheep' Burr				Y							
Acetosella vulgaris	Sheep Sorrel		Y	Y	Y	Y						
Alternanthera denticulata s.s.	Lesser Joyweed								Y			
Aira caryophyllea	Silvery Hair-grass				Y	Y						
Aira elegantissima	Delicate Hair-grass				Y							
Aira sp.	Hair-grass				Y							
Allocasuarina verticillata	Drooping Sheoke		Y		Y			Y				
Amaranthus muricatus	Rough-fruit Amaranth		Y									
Amphibromus nervosus	Common Swamp Wallaby-grass								Y			
Arctotheca calendula	Cape Weed				Y	Y						
Arthropodium sp. 1	Tall Vanilla-lily									Y		
Asperula conferta	Common Woodruff				Y							
Aster subulatus	Aster-weed				Y							
Atriplex semibaccata	Berry Saltbush						Y					Y

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
Austrodanthonia auriculata	Lobed Wallaby-grass				Y							
Austrodanthonia caepitosa	Common Wallaby-grass				Y	Y						
Austrodanthonia caespitosa	Common Wallaby-grass			Y								Y
Austrodanthonia carphoides	Short Wallaby-grass				Y							
Austrodanthonia duttoniana	Brown-Back Wallaby-grass					Y			Y			
Austrodanthonia eriantha	Hill Wallaby-grass		Y		Y							
Austrodanthonia fulva	Copper-awned Wallaby-grass		Y	Y								Y
Austrodanthonia pilosa	Velvet Wallaby-grass					Y						
Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass			Y								Y
Austrodanthonia setacea	Bristly Wallaby-grass		Y	Y	Y	Y						Y
Austrodanthonia spp.	Wallaby Grasses				Y	Y						Y
Austrostipa ?blackii	Crested Spear-grass			Y								
Austrostipa aristiglumis	Plump Spear-grass			Y								
Austrostipa bigeniculata	Spear grass		Y	Y	Y	Y						Y
Austrostipa curticoma	Spear grass		Y		Y	Y			Y			
Austrostipa densiflora	Dense Spear-grass			Y								
Austrostipa gibbosa	Spurred Spear-grass				Y	Y						Y
Austrostipa hemipogon	Half-bearded Spear-grass											Y
Austrostipa mollis	Supple Spear-grass				Y	Y						
Austrostipa oligostachya	Fine-head Spear-grass				Y							
Austrostipa scabra ssp. *falcata*	Rough Spear-grass		Y									Y
Austrostipa semibarbata	Fibrous Spear-grass		Y	Y								
Austrostipa setacea	Corkscrew Spear-grass			Y								
Austrostipa spp.	Spear Grasses		Y	Y		Y	Y					Y
Avena barbata	Bearded Oat				Y	Y						Y
Bothriochloa macra	Red-leg Grass				Y?							Y
Brassica fruticulosa	Twiggy Turnip				Y							
Briza maxima	Large quaking-grass		Y	Y	Y	Y						
Briza minor	Lesser Quaking-				Y							

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
	grass											
Bromus catharticus	Prairie Grass								Y			
Bromus diandrus	Great Brome				Y							Y
Bromus hordeaceus	Soft Brome				Y	Y						
Bromus rubens	Red Brome			Y								
Bursaria spinosa subsp. spinosa	Sweet Bursaria		Y									Y
Caesia calliantha	Blue Grass-lily		Y							Y		
Calocephalus citreus	Lemon Beauty-heads				Y					Y		
Calotis scabiosifolia var. scabiosifolia	Rough Burr-daisy											
Carex inversa s.l.	Knob Sedge		Y									Y
Cassinia arcuata	Drooping Cassinia				Y							
Centaurium tenuiflorum	Slender Centaury								Y			
Chamaecytisus palmensis	Tree Lucerne							Y				
Chamaesyce drummondii	Flat Spurge				Y							
Cheilanthes sieberi	Narrow Rock-fern		Y									
Chenopodium desertorum subsp microphyllum	Frosted Goosefoot											Y
Chenopodium murale	Sowbane				Y							Y
Chenopodium pumilio	Clammy Goosefoot								Y			
Chloris truncata	Windmill Grass		Y		Y	Y			Y			
Chrysocephalum apiculatum s.l.	Common Everlasting				Y	Y				Y		
Cirsium vulgare	Spear Thistle			Y	Y	Y	Y					
Clematis microphylla	Small-leaved Clematis		Y									Y
Convolvulus erubescens	Pink Bindweed				Y	Y						
Conyza sumatrensis	Tall Fleabane											
Crassula closiana	Stalked Crassula			Y								
Crassula helmsii	Swamp Crassula								Y			
Crassula sieberiana	Sieber Crassula		Y									
Crassula tetramera	Austral Stonecrop											Y
Critesion murinum ssp. *glaucum*	Blue Barley-grass				Y							
Cucumis myriocarpus	Paddy Melon				Y	Y						
Cynara cardunculus	Spanish Artichoke			Y	Y	Y						
Cynodon dactylon var.	Couch								Y			

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
dactylon												
Cynosurus echinatus	Rough Dog's-tail		Y	Y	Y	Y						
Cyperus eragrostis	Drain Flat-sedge								Y			Y
Dactylis glomerata	Cocksfoot			Y	Y	Y						
Dianella admixta	Black-anther Flax-lily		Y									
Dianella sp. aff. *longifolia* (Benambra)	Arching Flax-lily		Y	Y	Y							Y
Dichelachne crinita	Long-hair Plume-grass				Y	Y						
Dichondra repens	Kidney Weed		Y		Y							Y
Diuris sp. aff. chryseopsis (Basalt Plains)	Small Golden Moths											
Drosera peltata	Tall Sundew		Y		Y							
Echium plantagineum	Paterson's Curse					Y						
Ehrharta erecta	Panic Veldt Grass						Y					
Ehrharta longiflora	Annual Veldt Grass		Y	Y			Y					Y
Einadia nutans subsp. nutans	Nodding Saltbush		Y	Y		Y						Y
Eleocharis acuta	Common Spike-sedge								Y			
Eleocharis pusilla	Small Spike-sedge								Y			
Elymus scaber var. *scaber*	Common Wheat-grass		Y	Y	Y	Y						
Enchylaena tomentosa var. tomentosa (prostrate form)	Ruby Saltbush											Y
Enchylaena tomentosa var. tomentosa (shrubby form)	Ruby Saltbush											
Epilobium billardierianum	Robust Willow-herb				Y				Y			
Epilobium hirtigerum	Hairy Willow-herb				Y	Y			Y			Y
Eremophila deserti	Turkey-bush		Y									
Erodium botyrs	Big Herons-bill				Y	Y						
Eryngium ovinum	Blue Devil		Y		Y							
Eucalyptus melliodora	Yellow Box						Y					Y
Eucalyptus microcarpa	Grey Box		Y				Y					Y
Eucalytptus camaldulensis	River Red Gum			Y								
Eucalyptus cladocalyx	Sugar Gum											
Eucalyptus aff. *baueriana* (Werribee River Catchment)	Werribee Blue Box											Y

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
Euchiton collinus	Creeping Cudweed				Y							
Euchiton sphaericus	Annual Cudweed				Y							
Eutaxia microphylla	Common Eutaxia									Y		
Galenia pubescens var. pubescens	Galenia		Y									Y
Galium migrans	Wandering Bedstraw		Y									
Gamochaeta purpurea	Spiked Cudweed				Y	Y						
Geranium retrorsum	Grassland Cranesbill				Y							
Geranium sp.	Cranesbill				Y							
Glycine latrobeana	Clover Glycine											Y
Helminothotheca echioides	Ox-tongue				Y	Y						
Holcus lanatus	Yorkshire Fog				Y							
Hordeum murinum s.l.	Barley-grass											Y
Hypericum gramineum	Small St John's Wort		Y		Y	Y						
Hypochoeris glabra	Smooth's Cat's-ear		Y									
Hypochoeris radicata	Cat's Ear				Y	Y						
Juncus bufonis	Toad Rush								Y			
Juncus filicaulis	Thread Rush				Y							
Juncus flavidus	Yellow Rush				Y	Y			Y			Y
Juncus radula	Hoary Rush					Y						
Juncus subsecundus	Finger Rush				Y							Y
Lachnagrostis filiformis	Common Blown-grass				Y				Y	Y		
Lactuca serriola	Prickly Lettuce				Y							
Leontodon taraxacoides	Hairy Hawkbit				Y							
Lepidium africanum	Common Pepper-cress		Y	Y	Y	Y						
Lolium rigidum	Wimmera Rye-grass		Y	Y	Y	Y			Y			Y
Lomandra filiformis subsp. *coriacea*	Wattle Mat-rush				Y							
Lomandra filiformis s.l.	Wattle Mat-rush		Y									Y
Lomandra micrantha subsp. micrantha	Small-flower Mat-rush											Y
Lomandra nana	Dwarf Mat-rush				Y							
Lycium ferocissimum	African Box-thorn		Y		Y		Y	Y				Y
Lythrum hyssopifolia	Small Loosestrife		Y		Y	Y			Y			
Maireana enchylaenoides	Wingless Bluebush		Y		Y							Y
Marrubium vulgare	Horehound				Y	Y			Y			Y

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
Medicago polymorpha	Burr Medic							R				
Melicytus dentatus s.s.	Tree Violet		Y	Y			Y	Y				Y
Melicytus sp. aff. *dentatus* (Volcanic Plain variant)	Tangled Shrub-violet							Y	Y			
Mentha satureoides	Creeping mint							Y				
Microlaena stipoides var. *stipoides*	Weeping Grass		Y	Y	Y	Y						
Microseris sp.	Yam Daisy									Y		
Nassella neesiana	Chilean Needle-grass					Y						Y
Nassella trichotoma	Serrated Tussock		Y	Y	Y	Y	Y	Y	Y			Y
Opuntia ficus-indica	Indian Fig											Y
Oxalis exilis	Shady Wood-sorrel		Y			Y						
Oxalis perennans	Grassland Wood-sorrel		Y		Y							
Panicum ?decompositum	Australian Millet				Y							
Panicum effusum	Hairy Panic		Y	Y	Y							
Paspalum dilatatum	Paspalum								Y			
Paspalum distichum	Water Couch								Y			
Pelargonium australe	Austral Storks-bill									Y		
Pelargonium rodneyanum	Magenta Storks-bill		Y		Y							
Pentaschistus aeroides	False Hair-grass		Y	Y								
Persicaria prostrata	Creeping Knotweed								Y			
Phalaris aquatica	Toowomba Canary-grass				Y				Y			
Phalaris paradoxa	Paradoxical Canary-grass					Y						
Physalis viscosa	Sticky Ground-cherry				Y	Y						Y
Phytolacca octandra	Red-ink Weed		Y			Y						
Pimelea curviflora	Curved Rice-flower				Y							
Pimelea glauca	Smooth Rice-flower				Y							
Plantago lanceolata	Ribwort							R				
Poa annua	Annual Meadow-grass							R				
Poa morrissii	Soft Tussock-grass				Y							
Polycarpon tetraphyllum	Four-leaved Allseed		Y									
Polygonum aviculare s.l.	Prostrate Knotweed											
Polypogon monspeliensis	Annual Beard-grass								Y			

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
Potamogeton cheesemanii	Red Pondweed								Y			
Potamogeton ochreatus	Blunt Pondweed								Y			
Potamogeton pectinatus	Fennel Pondweed								Y			
Potamogeton tricarinatus	Floating Pondweed								Y			
Pseudognaphalium luteoalbum	Jersey Cudweed				Y	Y						
Ptilotus macrocephalus	Featherheads				Y							
Rapistrum rugosum	Giant Mustard				Y							
Rhagodia candolleana subsp. candolleana	Seaberry Saltbush											Y
Rhagodia parabolica	Fragrant Saltbush		Y									Y
Romulea minutiflora	Small-flower Onion-grass											Y
Romulea rosea var. australis	Common Onion-grass		Y	Y	Y	Y	Y	Y				Y
Rosa rubiginosa	Sweet Briar						Y	Y				
Rubus fruticosus spp. agg.	Bramble											
Rumex brownii	Slender Dock				Y							
Rumex conglomeratus	Clustered Dock								Y			
Rumex crispus	Curled Dock								Y			
Rumex dumosus	Wiry Dock				Y							
Schoenus apogon	Common Bog-sedge				Y	Y						
Senecio quadridentatus	Cotton Fireweed				Y							
Silybum marianum	Variegated Thistle								Y			
Solanum linnaeanum	Apple of Sodom		Y		Y	Y						
Solanum nigrum	Black Nightshade				Y				Y			
*Sonchus asper (*subsp. *asper*)	Rough Sow-thistle					Y						
Sonchus oleraceus	Sow-thistle				Y	Y	Y					
Stackhousia aff. *monogyna*	Creamy Candles =sp.1		Y		Y							
Themeda triandra	Kangaroo Grass		Y	Y	Y	Y	Y	Y				Y
Tribolium acutiflorum s.l.	Desmazeria											
Tricoryne elatior	Yellow Rush-lily		Y		Y							
Trifolium arvense	Hare's-foot Clover				Y							
Trifolium dubium	Suckling Clover				Y							
Trifolium glomeratum	Cluster Clover				Y							
Trifolium subterraneum	Subterraneum Clover				Y	Y						

SPECIES	COMMON NAME	Bush's Paddock	PW 803 (*Eucalyptus microcarpa*)	PGW 55_61 (*Eucalyptus camaldulensis*)	LrfPG 132_65 (*Themeda*)	LrfPG 132_65 (*A'stipa/A'danthonia*)	PW 803 (*Eucalyptus melliodora*)	Fenceline Shrubland	Wetland Formation	Planted Garden	Pinkerton Forest	PW 803 (*Eucalyptus microcarpa*)
Typha orientalis	Broad-leaf Cumbungi								Y			
Verbascum thapsus	Great Mullein				Y	Y						
Vicia sativa subsp. sativa	Common Vetch											
Vulpia bromoides	Squirrel-tail Fescue		Y	Y	Y	Y						
Vulpia myorus (forma *myorus*)	Rat's-tail Fescue			Y	Y	Y						
Xerochrysum viscosum	Shiny Everlasting									Y		
Xanthium spinosum	Bathurst Burr				Y	Y						
Wahlenbergia communis	Tufted Bluebell									Y		
Wahlenbergia gracilis	Spraling Bluebell									Y		
Whalleya proluta	Rigid Panic				Y							

Appendix 5 Plant quadrat data from Bush's Paddock and Pinkerton Forest, Mt Cottrell November 2006

Bush's Paddock Q1: E11959

Recs 26 Date : 21 Nov 2006 Location : 144°36'36" 37°45'38" Altitude : 141 Collector : LAAshby GWCarr Vegetation : Low rainfall Plains Grassland

1	255		*	Arctotheca calendula	Cape Weed
1	961			Austrodanthonia caespitosa	Common Wallaby-grass
1	980			Austrodanthonia setacea	Bristly Wallaby-grass
2	3266			Austrostipa bigeniculata	Kneed Spear-grass
1	3277			Austrostipa gibbosa	Spurred Spear-grass
1	340		*	Avena barbata	Bearded Oat
1	501		*	Bromus hordeaceus subsp. hordeaceus	Soft Brome
1	756			Chloris truncata	Windmill Grass
1	5549	k		Convolvulus angustissimus subsp. omnigracilis	Slender Bindweed
+	5560	v		Dianella sp. aff. longifolia (Benambra)	Arching Flax-lily
1	1033			Dichelachne crinita	Long-hair Plume-grass
1	1230		*	Erodium botrys	Big Heron's-bill
+	1239			Eryngium ovinum	Blue Devil
+	1399		*	Galenia pubescens var. pubescens	Galenia
1	1748		*	Hypochoeris radicata	Cat's Ear
1	1895		*	Leontodon taraxacoides subsp. taraxacoides	Hairy Hawkbit
1	1896		*	Lepidium africanum	Common Peppercress
1	2037		*	Lolium rigidum	Wimmera Rye-grass
+	4933			Melicytus dentatus s.s.	Tree Violet
1	2263		*	Nassella trichotoma	Serrated Tussock
+	2509		*	Physalis viscosa	Sticky Ground-cherry
1	4113		*	Romulea rosea var. australis s.s.	Common Onion-grass
+	3124			Senecio quadridentatus	Cotton Fireweed
1	3204		*	Sonchus oleraceus	Common Sow-thistle
2	3387			Themeda triandra	Kangaroo Grass
2	9223		*	Vulpia spp.	Fescue

Bush's Paddock Q2: E11960

Recs 15 Date : 21 Nov 2006 Location : 144°36'35" 37°45'40" Altitude : 138 Collector : LAAshby Vegetation : Low rainfall Plains Grassland

1	961			Austrodanthonia caespitosa	Common Wallaby-grass
1	980			Austrodanthonia setacea	Bristly Wallaby-grass
3	3266			Austrostipa bigeniculata	Kneed Spear-grass
1	340		*	Avena barbata	Bearded Oat
1	756			Chloris truncata	Windmill Grass
+	782		*	Cirsium vulgare	Spear Thistle
1	5549	k		Convolvulus angustissimus subsp. omnigracilis	Slender Bindweed
1	5560	v		Dianella sp. aff. longifolia (Benambra)	Arching Flax-lily
1	1748		*	Hypochoeris radicata	Cat's Ear
1	8683		*	Lolium spp.	Rye Grass
+	2101			Maireana enchylaenoides	Wingless Bluebush
1	2263		*	Nassella trichotoma	Serrated Tussock

1	4113		* Romulea rosea var. australis s.s.	Common Onion-grass
2	3387		Themeda triandra	Kangaroo Grass
1	9223		* Vulpia spp.	Fescue

Bush's Paddock Q3: E11961

Recs 13 Date : 21 Nov 2006 Location : 144°36'30" 37°45'37" Altitude : 135 Collector : LAAshby
Vegetation : Low rainfall Plains Grassland

1	961		Austrodanthonia caespitosa	Common Wallaby-grass
1	980		Austrodanthonia setacea	Bristly Wallaby-grass
2	3266		Austrostipa bigeniculata	Kneed Spear-grass
1	3286		Austrostipa oligostachya	Fine-head Spear-grass
+	667		Cassinia arcuata	Drooping Cassinia
1	5549	k	Convolvulus angustissimus subsp. omnigracilis	Slender Bindweed
+	5560	v	Dianella sp. aff. longifolia (Benambra)	Arching Flax-lily
+	1896		* Lepidium africanum	Common Peppercress
+	2037		* Lolium rigidum	Wimmera Rye-grass
1	2263		* Nassella trichotoma	Serrated Tussock
1	4113		* Romulea rosea var. australis s.s.	Common Onion-grass
3	3387		Themeda triandra	Kangaroo Grass
1	9223		* Vulpia spp.	Fescue

Bush's Paddock Q4: E11962

Recs 24 Date : 21 Nov 2006 Location : 144°36'17" 37°45'35" Altitude : 124 Collector : LAAshby GWCarr Vegetation : Low rainfall Plains Grassland

1	255		* Arctotheca calendula	Cape Weed
1	960		Austrodanthonia auriculata	Lobed Wallaby-grass
1	961		Austrodanthonia caespitosa	Common Wallaby-grass
1	962		Austrodanthonia carphoides	Short Wallaby-grass
1	980		Austrodanthonia setacea	Bristly Wallaby-grass
1	3266		Austrostipa bigeniculata	Kneed Spear-grass
1	3286		Austrostipa oligostachya	Fine-head Spear-grass
1	340		* Avena barbata	Bearded Oat
1	496		* Briza minor	Lesser Quaking-grass
+	582		Calocephalus citreus	Lemon Beauty-heads
+	5560	v	Dianella sp. aff. longifolia (Benambra)	Arching Flax-lily
1	1239		Eryngium ovinum	Blue Devil
+	8474		Geranium spp.	Crane's Bill
+	8683		* Lolium spp.	Rye Grass
+	2101		Maireana enchylaenoides	Wingless Bluebush
+	2263		* Nassella trichotoma	Serrated Tussock
1	2827		Ptilotus macrocephalus	Feather Heads
1	4113		* Romulea rosea var. australis s.s.	Common Onion-grass
+	3204		* Sonchus oleraceus	Common Sow-thistle
1	4721		Stackhousia sp. 1	Plains Stackhousia
2	3387		Themeda triandra	Kangaroo Grass
1	3421		Tricoryne elatior	Yellow Rush-lily
1	3440		* Trifolium subterraneum	Subterranean Clover
1	9223		* Vulpia spp.	Fescue

Bush's Paddock Q5: E11963

Recs 21 Date : 22 Nov 2006 Location : 144°36'18" 37°45'40" Altitude : 88 Collector : GWCarr
Vegetation : Plains Woodland

2	332		Atriplex semibaccata	Berry Saltbush
1	961		Austrodanthonia caespitosa	Common Wallaby-grass

1	977		Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass
1	980		Austrodanthonia setacea	Bristly Wallaby-grass
1	8361		Austrodanthonia spp.	Wallaby Grass
2	3266		Austrostipa bigeniculata	Kneed Spear-grass
1	3290		Austrostipa scabra	Rough Spear-grass
1	9099		Austrostipa spp.	Spear Grass
1	500	*	Bromus diandrus	Great Brome
1	756		Chloris truncata	Windmill Grass
1	1129	*	Ehrharta longiflora	Annual Veldt-grass
2	1133		Einadia nutans subsp. nutans	Nodding Saltbush
3	1298		Eucalyptus microcarpa	Grey Box
2	1896	*	Lepidium africanum	Common Peppercress
1	2037	*	Lolium rigidum	Wimmera Rye-grass
1	2078	*	Lycium ferocissimum	African Box-thorn
+	4933		Melicytus dentatus s.s.	Tree Violet
+	4934		Melicytus sp. aff. dentatus (Volcanic Plain varian	Tangled Shrub-violet
1	2179		Microlaena stipoides var. stipoides	Weeping Grass
1	2263	*	Nassella trichotoma	Serrated Tussock
1	4113	*	Romulea rosea var. australis s.s.	Common Onion-grass

Bush's Paddock Q6: E11964

Recs 25 Date : 22 Nov 2006 Location : 144°36'09" 37°45'37" Altitude : 121 Collector : GWCarr
Vegetation : Plains Grassy Woodland

1	961		Austrodanthonia caespitosa	Common Wallaby-grass
1	977		Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass
1	980		Austrodanthonia setacea	Bristly Wallaby-grass
2	3266		Austrostipa bigeniculata	Kneed Spear-grass
1	3271		Austrostipa densiflora	Dense Spear-grass
1	3279		Austrostipa mollis	Supple Spear-grass
1	3290		Austrostipa scabra	Rough Spear-grass
1	9099		Austrostipa spp.	Spear Grass
2	500	*	Bromus diandrus	Great Brome
1	864		Crassula closiana	Stalked Crassula
+	5560	v	Dianella sp. aff. longifolia (Benambra)	Arching Flax-lily
2	1129	*	Ehrharta longiflora	Annual Veldt-grass
1	1133		Einadia nutans subsp. nutans	Nodding Saltbush
3	1258		Eucalyptus camaldulensis	River Red-gum
2	1298		Eucalyptus microcarpa	Grey Box
1	2037	*	Lolium rigidum	Wimmera Rye-grass
1	2078	*	Lycium ferocissimum	African Box-thorn
+	4933		Melicytus dentatus s.s.	Tree Violet
+	4934		Melicytus sp. aff. dentatus (Volcanic Plain varian	Tangled Shrub-violet
1	2179		Microlaena stipoides var. stipoides	Weeping Grass
1	2263	*	Nassella trichotoma	Serrated Tussock
1	2457	*	Pentaschistis airoides subsp. airoides	False Hair-grass
1	4113	*	Romulea rosea var. australis s.s.	Common Onion-grass
1	3387		Themeda triandra	Kangaroo Grass
1	9223	*	Vulpia spp.	Fescue

Bush's Paddock Q7: E11965

Recs 25 Date : 22 Nov 2006 Location : 144°36'03" 37°45'38" Altitude : 120 Collector : GWCarr
Vegetation : Plains Woodland

1	45			Acacia implexa	Lightwood
1	685			Allocasuarina verticillata	Drooping Sheoak
+	196		*	Amaranthus muricatus	Rough-fruit Amaranth
1	332			Atriplex semibaccata	Berry Saltbush
1	961			Austrodanthonia caespitosa	Common Wallaby-grass
1	4409			Austrodanthonia fulva	Copper-awned Wallaby-grass
1	980			Austrodanthonia setacea	Bristly Wallaby-grass
2	3266			Austrostipa bigeniculata	Kneed Spear-grass
1	3279			Austrostipa mollis	Supple Spear-grass
1	3290			Austrostipa scabra	Rough Spear-grass
2	9099			Austrostipa spp.	Spear Grass
1	500		*	Bromus diandrus	Great Brome
1	790			Clematis microphylla	Small-leaved Clematis
1	5560	v		Dianella sp. aff. longifolia (Benambra)	Arching Flax-lily
1	1129		*	Ehrharta longiflora	Annual Veldt-grass
1	1133			Einadia nutans subsp. nutans	Nodding Saltbush
4	1298			Eucalyptus microcarpa	Grey Box
+	1843			Juncus subsecundus	Finger Rush
1	1896		*	Lepidium africanum	Common Peppercress
1	2037		*	Lolium rigidum	Wimmera Rye-grass
+	2078		*	Lycium ferocissimum	African Box-thorn
1	2179			Microlaena stipoides var. stipoides	Weeping Grass
1	2263		*	Nassella trichotoma	Serrated Tussock
1	4113		*	Romulea rosea var. australis s.s.	Common Onion-grass
1	3387			Themeda triandra	Kangaroo Grass

Bush's Paddock Q8: E11966

Recs 21 Date : 22 Nov 2006 Location : 144°35'53" 37°45'35" Altitude : 117 Collector : LAAshby GWCarr Vegetation : Low rainfall Plains Grassland

+	196		*	Amaranthus muricatus	Rough-fruit Amaranth
1	255		*	Arctotheca calendula	Cape Weed
1	332			Atriplex semibaccata	Berry Saltbush
1	960			Austrodanthonia auriculata	Lobed Wallaby-grass
1	961			Austrodanthonia caespitosa	Common Wallaby-grass
1	962			Austrodanthonia carphoides	Short Wallaby-grass
1	980			Austrodanthonia setacea	Bristly Wallaby-grass
2	3266			Austrostipa bigeniculata	Kneed Spear-grass
1	3290			Austrostipa scabra	Rough Spear-grass
1	9099			Austrostipa spp.	Spear Grass
1	340		*	Avena barbata	Bearded Oat
1	501		*	Bromus hordeaceus subsp. hordeaceus	Soft Brome
1	756			Chloris truncata	Windmill Grass
2	1230		*	Erodium botrys	Big Heron's-bill
1	1748		*	Hypochoeris radicata	Cat's Ear
1	2037		*	Lolium rigidum	Wimmera Rye-grass
1	2263		*	Nassella trichotoma	Serrated Tussock
1	4113		*	Romulea rosea var. australis s.s.	Common Onion-grass
+	3204		*	Sonchus oleraceus	Common Sow-thistle
1	3440		*	Trifolium subterraneum	Subterranean Clover
1	9223		*	Vulpia spp.	Fescue

Bush's Paddock Q9: E11967

Recs 26 Date : 22 Nov 2006 Location : 144°35'57" 37°45'31" Altitude : 109 Collector : LAAshby
GWCarr Vegetation : Wetland Formation

1	5097		Alternanthera denticulata s.s.	Lesser Joyweed
+	498	*	Bromus catharticus	Prairie Grass
1	705	*	Centaurium tenuiflorum	Slender Centaury
1	748		Chenopodium pumilio	Clammy Goosefoot
1	862		Crassula helmsii	Swamp Crassula
1	4554	*	Cynodon dactylon var. dactylon	Couch
1	918	*	Cyperus eragrostis	Drain Flat-sedge
2	1139		Eleocharis acuta	Common Spike-sedge
1	1179		Epilobium hirtigerum	Hairy Willow-herb
1	2511	*	Helminthotheca echioides	Ox-tongue
1	1810		Juncus bufonius	Toad Rush
1	1818		Juncus flavidus	Gold Rush
1	151		Lachnagrostis filiformis	Common Blown-grass
1	2037	*	Lolium rigidum	Wimmera Rye-grass
1	2092		Lythrum hyssopifolia	Small Loosestrife
1	2430	*	Paspalum dilatatum	Paspalum
1	2640	*	Polypogon monspeliensis	Annual Beard-grass
+	5274		Potamogeton cheesemanii	Red Pondweed
2	2690		Potamogeton ochreatus	Blunt Pondweed
2	2691		Potamogeton pectinatus	Fennel Pondweed
1	2762		Pseudognaphalium luteoalbum	Jersey Cudweed
+	2968		Rumex brownii	Slender Dock
1	2969	*	Rumex conglomeratus	Clustered Dock
1	2970	*	Rumex crispus	Curled Dock
1	3203	*	Sonchus asper s.l.	Rough Sow-thistle
2	3470		Typha orientalis	Broad-leaf Cumbungi

Bush's Paddock Q10: E11968

Recs 21 Date : 22 Nov 2006 Location : 144°36'00" 37°45'32" Altitude : 118 Collector : LAAshby
GWCarr Vegetation : Plains Woodland

+	78		Acacia pycnantha	Golden Wattle
1	332		Atriplex semibaccata	Berry Saltbush
2	3266		Austrostipa bigeniculata	Kneed Spear-grass
1	3290		Austrostipa scabra	Rough Spear-grass
1	9099		Austrostipa spp.	Spear Grass
1	500	*	Bromus diandrus	Great Brome
+	756		Chloris truncata	Windmill Grass
+	4554	*	Cynodon dactylon var. dactylon	Couch
1	1036		Dichondra repens	Kidney-weed
1	1129	*	Ehrharta longiflora	Annual Veldt-grass
1	1133		Einadia nutans subsp. nutans	Nodding Saltbush
3	1298		Eucalyptus microcarpa	Grey Box
1	1896	*	Lepidium africanum	Common Peppercress
1	2078	*	Lycium ferocissimum	African Box-thorn
1	2101		Maireana enchylaenoides	Wingless Bluebush
+	4933		Melicytus dentatus s.s.	Tree Violet
1	2263	*	Nassella trichotoma	Serrated Tussock
+	2622	*	Polycarpon tetraphyllum	Four-leaved Allseed
1	2929	r	Rhagodia parabolica	Fragrant Saltbush
1	4113	*	Romulea rosea var. australis s.s.	Common Onion-grass
+	2968		Rumex brownii	Slender Dock

Pinkerton Forest Q1: E11969

Recs 27 Date : 21 Nov 2006 Location : 144°35'42" 37°45'55" Altitude : 124 Collector : LAAshby GWCarr Vegetation : Plains Woodland

+	78				Acacia pycnantha	Golden Wattle
1	332				Atriplex semibaccata	Berry Saltbush
1	961				Austrodanthonia caespitosa	Common Wallaby-grass
1	977				Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass
1	980				Austrodanthonia setacea	Bristly Wallaby-grass
1	8361				Austrodanthonia spp.	Wallaby Grass
3	3266				Austrostipa bigeniculata	Kneed Spear-grass
1	3277				Austrostipa gibbosa	Spurred Spear-grass
1	3290				Austrostipa scabra	Rough Spear-grass
1	9099				Austrostipa spp.	Spear Grass
1	500			*	Bromus diandrus	Great Brome
+	4337				Crassula tetramera	Australian Stonecrop
+	1036				Dichondra repens	Kidney-weed
1	1129			*	Ehrharta longiflora	Annual Veldt-grass
1	1133				Einadia nutans subsp. nutans	Nodding Saltbush
1	1156				Enchylaena tomentosa var. tomentosa	Ruby Saltbush
2	1298				Eucalyptus microcarpa	Grey Box
1	1399			*	Galenia pubescens var. pubescens	Galenia
+	1456	V	v		Glycine latrobeana	Clover Glycine
1	2037			*	Lolium rigidum	Wimmera Rye-grass
1	2078			*	Lycium ferocissimum	African Box-thorn
1	2101				Maireana enchylaenoides	Wingless Bluebush
1	2263			*	Nassella trichotoma	Serrated Tussock
1	2927				Rhagodia candolleana subsp. candolleana	Seaberry Saltbush
1	2929		r		Rhagodia parabolica	Fragrant Saltbush
1	2941			*	Romulea minutiflora	Small-flower Onion-grass
1	4113			*	Romulea rosea var. australis s.s.	Common Onion-grass

Pinkerton Forest Q2: E11970

Recs 20 Date : 22 Nov 2006 Location : 144°35'53" 37°45'53" Altitude : 129 Collector : LAAshby GWCarr Vegetation : Plains Woodland

1	332				Atriplex semibaccata	Berry Saltbush
1	961				Austrodanthonia caespitosa	Common Wallaby-grass
1	4409				Austrodanthonia fulva	Copper-awned Wallaby-grass
1	977				Austrodanthonia racemosa var. racemosa	Stiped Wallaby-grass
1	980				Austrodanthonia setacea	Bristly Wallaby-grass
2	3266				Austrostipa bigeniculata	Kneed Spear-grass
1	3290				Austrostipa scabra	Rough Spear-grass
1	9099				Austrostipa spp.	Spear Grass
1	500			*	Bromus diandrus	Great Brome
1	1129			*	Ehrharta longiflora	Annual Veldt-grass
1	1133				Einadia nutans subsp. nutans	Nodding Saltbush
3	1298				Eucalyptus microcarpa	Grey Box
1	1399			*	Galenia pubescens var. pubescens	Galenia
+	1456	V	v		Glycine latrobeana	Clover Glycine

1	2037	*	Lolium rigidum	Wimmera Rye-grass
+	2047		Lomandra micrantha s.l.	Small-flower Mat-rush
1	2078	*	Lycium ferocissimum	African Box-thorn
1	2101		Maireana enchylaenoides	Wingless Bluebush
1	2263	*	Nassella trichotoma	Serrated Tussock
1	4113	*	Romulea rosea var. australis s.s.	Common Onion-grass

Pinkerton Forest Q3: E11971

Recs 19 Date : 22 Nov 2006 Location : 144°35'54" 37°46'05" Altitude : 113 Collector : LAAshby GWCarr Vegetation : Plains Woodland

1	78		Acacia pycnantha	Golden Wattle
1	332		Atriplex semibaccata	Berry Saltbush
1	4409		Austrodanthonia fulva	Copper-awned Wallaby-grass
1	980		Austrodanthonia setacea	Bristly Wallaby-grass
1	8361		Austrodanthonia spp.	Wallaby Grass
2	3266		Austrostipa bigeniculata	Kneed Spear-grass
1	3290		Austrostipa scabra	Rough Spear-grass
1	9099		Austrostipa spp.	Spear Grass
1	500	*	Bromus diandrus	Great Brome
1	1036		Dichondra repens	Kidney-weed
1	1129	*	Ehrharta longiflora	Annual Veldt-grass
1	1133		Einadia nutans subsp. nutans	Nodding Saltbush
2	1298		Eucalyptus microcarpa	Grey Box
1	1399	*	Galenia pubescens var. pubescens	Galenia
1	2037	*	Lolium rigidum	Wimmera Rye-grass
1	2078	*	Lycium ferocissimum	African Box-thorn
1	2101		Maireana enchylaenoides	Wingless Bluebush
1	2263	*	Nassella trichotoma	Serrated Tussock
1	4113	*	Romulea rosea var. australis s.s.	Common Onion-grass

Pinkerton Forest Q4: E11972

Recs 21 Date : 22 Nov 2006 Location : 144°35'43" 37°46'01" Altitude : 115 Collector : LAAshby GWCarr Vegetation : Plains Woodland

1	332		Atriplex semibaccata	Berry Saltbush
1	961		Austrodanthonia caespitosa	Common Wallaby-grass
1	980		Austrodanthonia setacea	Bristly Wallaby-grass
1	8361		Austrodanthonia spp.	Wallaby Grass
2	3266		Austrostipa bigeniculata	Kneed Spear-grass
1	3290		Austrostipa scabra	Rough Spear-grass
1	9099		Austrostipa spp.	Spear Grass
1	8098	*	Avena spp.	Oat
1	515		Bursaria spinosa subsp. spinosa	Sweet Bursaria
1	746	*	Chenopodium murale	Sowbane
1	1129	*	Ehrharta longiflora	Annual Veldt-grass
1	1133		Einadia nutans subsp. nutans	Nodding Saltbush
1	1156		Enchylaena tomentosa var. tomentosa	Ruby Saltbush
2	1249		*Eucalyptus* aff. *baueriana* (Werribee River Catchment)	Werribee Blue Box
1	1297		Eucalyptus melliodora	Yellow Box
1	1298		Eucalyptus microcarpa	Grey Box
1	1399	*	Galenia pubescens var. pubescens	Galenia
1	2123	*	Marrubium vulgare	Horehound

	1	2263		*	Nassella trichotoma	Serrated Tussock
	+	2929	r		Rhagodia parabolica	Fragrant Saltbush
	1	4113		*	Romulea rosea var. australis s.s.	Common Onion-grass

Bush's Paddock Incidental Records: T09225

Recs 63 Date : 22 Nov 2006 Location : 144°36'17" 37°45'35" Altitude : 120 Collector : LAAshby GWCarr Vegetation : NA

	+	7			Acacia acinacea s.l.	Gold-dust Wattle
	+	45			Acacia implexa	Lightwood
	+	45			Acacia implexa	Lightwood
	+	2966		*	Acetosella vulgaris	Sheep Sorrel
	+	8024		*	Aira spp.	Hair Grass
	+	3985	r		Austrostipa hemipogon	Half-bearded Spear-grass
	+	3279			Austrostipa mollis	Supple Spear-grass
	+	3291			Austrostipa semibarbata	Fibrous Spear-grass
	+	488		*	Brassica fruticulosa	Twiggy Turnip
	+	495		*	Briza maxima	Large Quaking-grass
	+	496		*	Briza minor	Lesser Quaking-grass
	+	498		*	Bromus catharticus	Prairie Grass
	+	500		*	Bromus diandrus	Great Brome
	+	515			Bursaria spinosa subsp. spinosa	Sweet Bursaria
	+	519			Caesia calliantha	Blue Grass-lily
	+	582			Calocephalus citreus	Lemon Beauty-heads
	+	642			Carex inversa	Knob Sedge
	+	746		*	Chenopodium murale	Sowbane
	+	782		*	Cirsium vulgare	Spear Thistle
	+	810		*	Conyza sumatrensis	Tall Fleabane
	+	906		*	Cynara cardunculus	Spanish Artichoke
	+	907			Cynodon dactylon	Couch
	+	912		*	Cynosurus echinatus	Rough Dog's-tail
	+	948		*	Dactylis glomerata	Cocksfoot
	+	5555			Dianella admixta	Black-anther Flax-lily
	+	1128		*	Ehrharta erecta var. erecta	Panic Veldt-grass
	+	1133			Einadia nutans subsp. nutans	Nodding Saltbush
	+	1156			Enchylaena tomentosa var. tomentosa	Ruby Saltbush
	+	2237			Eremophila deserti	Turkey Bush
	+	1263		*	Eucalyptus cladocalyx	Sugar Gum
	+	1297			Eucalyptus melliodora	Yellow Box
	+	1399		*	Galenia pubescens var. pubescens	Galenia
	+	4336		*	Gamochaeta purpurea s.s.	Spiked Cudweed
	+	2511		*	Helminthotheca echioides	Ox-tongue
	+	1692		*	Holcus lanatus	Yorkshire Fog
	+	3695		*	Hordeum murinum s.l.	Barley-grass
	+	1818			Juncus flavidus	Gold Rush
	+	1843			Juncus subsecundus	Finger Rush
	+	1860		*	Lactuca serriola	Prickly Lettuce
	+	2042			Lomandra filiformis	Wattle Mat-rush
	+	2078		*	Lycium ferocissimum	African Box-thorn
	+	2123		*	Marrubium vulgare	Horehound
	+	2170			Mentha satureoides	Creeping mint
	+	2179			Microlaena stipoides var. stipoides	Weeping Grass
	+	3282		*	Nassella neesiana	Chilean Needle-grass

+	2386		Oxalis perennans	Grassland Wood-sorrel
+	2476	*	Phalaris aquatica	Toowoomba Canary-grass
+	2561	*	Plantago lanceolata	Ribwort
+	2626	*	Polygonum aviculare s.l.	Prostrate Knotweed
+	2758	*	Prunus cerasifera	Cherry Plum
+	2762		Pseudognaphalium luteoalbum	Jersey Cudweed
+	2827		Ptilotus macrocephalus	Feather Heads
+	2919	*	Rapistrum rugosum	Giant Mustard
+	2950	*	Rosa rubiginosa	Sweet Briar
+	8998		Rubus spp.	Bramble
+	2968		Rumex brownii	Slender Dock
+	2970	*	Rumex crispus	Curled Dock
+	2972		Rumex dumosus	Wiry Dock
+	4721		Stackhousia sp. 1	Plains Stackhousia
+	2547	*	Tribolium acutiflorum s.l.	Desmazeria
+	3421		Tricoryne elatior	Yellow Rush-lily
+	5054	*	Vicia sativa subsp. sativa	Common Vetch
+	2406		Whalleya proluta	Rigid Panic

Pinkerton Forest Incidental Records: T09226

Recs 20 Date : 22 Nov 2006 Location : 144°35'43" 37°46'01" Altitude : 115 Collector : LAAshby GWCarr Vegetation : NA

+	7		Acacia acinacea s.l.	Gold-dust Wattle
+	3985	r	Austrostipa hemipogon	Half-bearded Spear-grass
+	515		Bursaria spinosa subsp. spinosa	Sweet Bursaria
+	642		Carex inversa	Knob Sedge
+	741		Chenopodium desertorum	Frosted Goosefoot
+	790		Clematis microphylla	Small-leaved Clematis
+	918	*	Cyperus eragrostis	Drain Flat-sedge
+	5560	v	Dianella sp. aff. longifolia (Benambra)	Arching Flax-lily
+	1156		Enchylaena tomentosa var. tomentosa	Ruby Saltbush
+	1179		Epilobium hirtigerum	Hairy Willow-herb
+	1297		Eucalyptus melliodora	Yellow Box
+	1399	*	Galenia pubescens var. pubescens	Galenia
+	3695	*	Hordeum murinum s.l.	Barley-grass
+	1818		Juncus flavidus	Gold Rush
+	1843		Juncus subsecundus	Finger Rush
+	2042		Lomandra filiformis	Wattle Mat-rush
+	2047		Lomandra micrantha s.l.	Small-flower Mat-rush
+	2123	*	Marrubium vulgare	Horehound
+	4933		Melicytus dentatus s.s.	Tree Violet
+	2263	*	Nassella trichotoma	Serrated Tussock

Appendix 6: Bird data, Pinkerton Forest and Bush's Paddock, miscellaneous analyses

All bird data from Bird Observers Club of Australia (per Dave Torr), Ecology Australia (this study), and other sources (Wildlife Profiles report, Birding-Aus email archive). Wetland birds and other vagrants to the woodland were excluded from analyses.

All species recorded at PF and BP. Relative abundance (% reporting rate).

Common name	Scientific name	BP	PF	Total
Stubble Quail	*Coturnix pectoralis*	5	0	2.5
Black Swan	*Cygnus atratus*	20	15	17.5
Australian Shelduck	*Tadorna tadornoides*	20	25	22.5
Australian Wood Duck	*Chenonetta jubata*	5	45	25
Grey Teal	*Anas gracilis*	15	45	30
Chestnut Teal	*Anas castanea*	10	25	17.5
Pacific Black Duck	*Anas superciliosa*	10	20	15
Pink-eared Duck	*Malacorhynchus membranaceus*	0	5	2.5
Hardhead	*Aythya australis*	5	5	5
Blue-billed Duck	*Oxyura australis*	5	0	2.5
Musk Duck	*Biziura lobata*	20	0	10
Hoary-headed Grebe	*Poliocephalus poliocephalus*	25	20	22.5
Great Crested Grebe	*Podiceps cristatus*	5	0	2.5
Little Black Cormorant	*Phalacrocorax sulcirostris*	15	5	10
Great Cormorant	*Phalacrocorax carbo*	15	15	15
Pied Cormorant	*Phalacrocorax varius*	0	5	2.5
Little Pied Cormorant	*Phalacrocorax melanoleucos*	20	10	15
Australian Pelican	*Pelecanus conspicillatus*	10	20	15
White-necked Heron	*Ardea pacifica*	0	10	5
White-faced Heron	*Egretta novaehollandiae*	30	15	22.5
Australian White Ibis	*Threskiornis molucca*	5	20	12.5
Straw-necked Ibis	*Threskiornis spinicollis*	30	40	35
Black-shouldered Kite	*Elanus axillaris*	35	25	30
Whistling Kite	*Haliastur sphenurus*	15	45	30
Swamp Harrier	*Circus approximans*	5	5	5
Spotted Harrier	*Circus assimilis*	5	0	2.5
Grey Goshawk	*Accipiter novaehollandiae*	0	5	2.5
Brown Goshawk	*Accipiter fasciatus*	10	30	20
Wedge-tailed Eagle	*Aquila audax*	40	55	47.5
Little Eagle	*Hieraaetus morphnoides*	5	10	7.5
Nankeen Kestrel	*Falco cenchroides*	20	5	12.5
Brown Falcon	*Falco berigora*	25	45	35
Peregrine Falcon	*Falco peregrinus*	5	0	2.5
Eurasian Coot	*Fulica atra*	40	15	27.5
Masked Lapwing	*Vanellus miles*	30	15	22.5
Red-kneed Dotterel	*Erythrogonys cinctus*	0	5	2.5
Black-fronted Dotterel	*Elseyornis melanops*	5	10	7.5
Rock Dove	*Columba livia*	5	5	5
Spotted Turtle-Dove	*Streptopelia chinensis*	15	25	20
Crested Pigeon	*Ocyphaps lophotes*	15	50	32.5
Galah	*Cacatua roseicapilla*	40	85	62.5
Long-billed Corella	*Cacatua tenuirostris*	10	30	20
Little Corella	*Cacatua sanguinea*	0	20	10

Common name	Scientific name	BP	PF	Total
Sulphur-crested Cockatoo	*Cacatua galerita*	30	50	40
Musk Lorikeet	*Glossopsitta concinna*	0	5	2.5
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	0	5	2.5
Crimson Rosella	*Platycercus elegans*	5	20	12.5
Eastern Rosella	*Platycercus eximius*	50	75	62.5
Red-rumped Parrot	*Psephotus haematonotus*	55	95	75
Blue-winged Parrot	*Neophema chrysostoma*	5	0	2.5
Budgerigar	*Melopsittacus undulatus*	5	0	2.5
Pallid Cuckoo	*Cuculus pallidus*	15	5	10
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	5	10	7.5
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	15	10	12.5
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	5	5	5
Southern Boobook	*Ninox boobook*	0	5	2.5
Barn Owl	*Tyto alba*	0	15	7.5
White-throated Needletail	*Hirundapus caudacutus*	5	0	2.5
Laughing Kookaburra	*Dacelo novaeguineae*	15	55	35
Sacred Kingfisher	*Todiramphus sanctus*	10	5	7.5
White-throated Treecreeper	*Cormobates leucophaeus*	0	10	5
Brown Treecreeper	*Climacteris picumnus*	5	65	35
Superb Fairy-wren	*Malurus cyaneus*	90	90	90
Spotted Pardalote	*Pardalotus punctatus*	15	30	22.5
Striated Pardalote	*Pardalotus striatus*	45	70	57.5
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	75	70	72.5
Yellow Thornbill	*Acanthiza nana*	25	30	27.5
Weebill	*Smicrornis brevirostris*	0	10	5
Southern Whiteface	*Aphelocephala leucopsis*	0	5	2.5
White-plumed Honeyeater	*Lichenostomus penicillatus*	85	95	90
White-naped Honeyeater	*Melithreptus lunatus*	0	5	2.5
Brown-headed Honeyeater	*Melithreptus brevirostris*	0	10	5
New Holland Honeyeater	*Phylidonyris novaehollandiae*	5	10	7.5
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	5	0	2.5
Red Wattlebird	*Anthochaera carunculata*	25	40	32.5
Jacky Winter	*Microeca fascinans*	80	100	90
Flame Robin	*Petroica phoenicea*	15	20	17.5
Varied Sittella	*Daphoenositta chrysoptera*	0	5	2.5
Eastern Shrike-tit	*Falcunculus frontatus*	20	0	10
Golden Whistler	*Pachycephala pectoralis*	25	15	20
Rufous Whistler	*Pachycephala rufiventris*	55	10	32.5
Grey Shrike-thrush	*Colluricincla harmonica*	10	5	7.5
Restless Flycatcher	*Myiagra inquieta*	0	5	2.5
Magpie-lark	*Grallina cyanoleuca*	40	60	50
Willie Wagtail	*Rhipidura leucophrys*	85	65	75
Grey Fantail	*Rhipidura albiscapa*	60	20	40
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	30	40	35
White-winged Triller	*Lalage tricolor*	15	5	10
Masked Woodswallow	*Artamus personatus*	5	0	2.5
White-browed Woodswallow	*Artamus superciliosus*	10	0	5
Dusky Woodswallow	*Artamus cyanopterus*	50	30	40
Australian Magpie	*Gymnorhina tibicen*	95	100	97.5
Australian Raven	*Corvus coronoides*	10	5	7.5
Little Raven	*Corvus mellori*	60	70	65
Singing Bushlark	*Mirafra javanica*	20	0	10

Common name	Scientific name	BP	PF	Total
Skylark	*Alauda arvensis*	60	5	32.5
Australian Pipit	*Anthus australis*	45	10	27.5
House Sparrow	*Passer domesticus*	75	75	75
Diamond Firetail	*Stagonopleura guttata*	60	65	62.5
Red-browed Finch	*Neochmia temporalis*	5	10	7.5
Zebra Finch	*Taeniopygia guttata*	65	45	55
European Greenfinch	*Carduelis chloris*	0	10	5
European Goldfinch	*Carduelis carduelis*	25	40	32.5
Welcome Swallow	*Hirundo neoxena*	45	65	55
Tree Martin	*Petrochelidon nigricans*	60	85	72.5
Common Blackbird	*Turdus merula*	15	35	25
Common Myna	*Acridotheres tristis*	15	50	32.5
Common Starling	*Sturnus vulgaris*	60	95	77.5

15 most frequently recorded species at BP and PF

Bush's Paddock			Pinkerton Forest		
Australian Magpie	*Gymnorhina tibicen*	95	Jacky Winter	*Microeca fascinans*	100
Superb Fairy-wren	*Malurus cyaneus*	90	Australian Magpie	*Gymnorhina tibicen*	100
White-plumed Honeyeater	*Lichenostomus penicillatus*	85	Red-rumped Parrot	*Psephotus haematonotus*	95
Willie Wagtail	*Rhipidura leucophrys*	85	White-plumed Honeyeater	*Lichenostomus penicillatus*	95
Jacky Winter	*Microeca fascinans*	80	Common Starling	*Sturnus vulgaris*	95
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	75	Superb Fairy-wren	*Malurus cyaneus*	90
House Sparrow	*Passer domesticus*	75	Galah	*Cacatua roseicapilla*	85
Zebra Finch	*Taeniopygia guttata*	65	Tree Martin	*Petrochelidon nigricans*	85
Grey Fantail	*Rhipidura albiscapa*	60	Eastern Rosella	*Platycercus eximius*	75
Little Raven	*Corvus mellori*	60	House Sparrow	*Passer domesticus*	75
Skylark	*Alauda arvensis*	60	Striated Pardalote	*Pardalotus striatus*	70
Diamond Firetail	*Stagonopleura guttata*	60	Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	70
Tree Martin	*Petrochelidon nigricans*	60	Little Raven	*Corvus mellori*	70
Common Starling	*Sturnus vulgaris*	60	Brown Treecreeper	*Climacteris picumnus*	65
Red-rumped Parrot	*Psephotus haematonotus*	55	Willie Wagtail	*Rhipidura leucophrys*	65

Appendix 7: Criteria used by Ecology Australia for assessment of conservation significance of flora values.

In the context of the present study the following areas apply to the scale of significance for indigenous plant species and biodiversity of a site:

Local:	Shire of Melton
Regional:	Victorian Volcanic Plain
State:	Victoria
National:	Australia

Significance of plant species

Species significance is generally an indication of rarity or population decline. The assessment of significance of plant species recorded during this study is determined according to the following criteria for each geographic scale:

Local All indigenous flora is considered significant at a local level because of the massive decline in native vegetation since European settlement, and the continued incremental loss of habitat and reductions in abundance due to development and habitat degradation.

Regional In the context of the relevant Victorian bioregion, plant species are considered to be of regional significance when the species has a recording rate of less than 1%, as determined by interrogation of the Flora Information System database. However, this approach is influenced by sampling bias in particular vegetation types, so species may be included or excluded from the regional significance category where common sense and knowledge of the regional flora indicates.

State A taxon is considered significant at a State level if it is:

- listed under the *Victoria Flora and Fauna Guarantee Act 1988*; or
- considered to be rare, vulnerable, or endangered in Victoria by DSE (2003b), or Ross and Walsh (2003).

National A taxon is considered significant at a National level if it is:

- listed as Vulnerable, Endangered, Critically Endangered, or Presumed Extinct under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*; or
- considered to be rare, vulnerable, or endangered in Australia by DSE (2005a) or Ross and Walsh (2003).

- endemic to Victoria and is considered to be rare, vulnerable, or endangered in Victoria by DSE (2003b), or Ross and Walsh (2003).

Significance of Vegetation Communities and Ecological Vegetation Classes (EVCs)

Significance of vegetation types has been determined in two ways in this report:

1. Significance of a remnant according to its condition and the status of the EVC within the Bioregion (the Net Gain approach to significance: explained further below)
2. Listing of a vegetation community as rare or threatened under the Victorian *Flora and Fauna Guarantee Act 1988* or the Federal *Environment Protection and Biodiversity Conservation Act 1999.*

Determination of significance according to Net Gain

Victoria is implementing a new approach to the assessment of remnant vegetation through the 'habitat hectare' system (a measure of size and condition), as set out in Victoria's Native Vegetation Management – A Framework for Action (DSE 2002b). Of particular relevance is Table 5 (Appendix 3) of that document which is largely summarised in Table A, below.

To assist in planning for biodiversity conservation, Victoria is divided into 27 'bioregions' - geographic units based on a common suite of biophysical characteristics (DSE 2002a). The Ecological Vegetation Classes occurring within each bioregion have been assessed, based on the degree of depletion / clearing that has occurred since European settlement and the area of extant vegetation secured in a conservation reserve, to determine their conservation status. Criteria for each conservation status are given in Table B.

The condition score (h) of a particular remnant is then combined with the bioregional conservation status of the relevant EVC to determine the conservation significance of the EVC at the site.

Table A. The relationship between EVC Conservation Status, Vegetation Condition, and Conservation Significance (Low – Very High).

Conservation Status*	Condition Score (h)									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Endangered	HIGH			VERY HIGH**						
Vulnerable	MEDIUM		HIGH		VERY HIGH					
Rare	MEDIUM		HIGH			VERY HIGH				
Depleted	LOW		MEDIUM			HIGH				
Least Concern	LOW					MEDIUM				

* As determined by reference to relevant bioregional plan / EVC database

** Other attributes (such as population size of a threatened taxon) may over-ride condition score alone.

Table B. Criteria for the Bioregional Conservation Status categories of EVCs

Status		Criteria
Presumed Extinct	X	Probably no longer present in the bioregion
Endangered	E1	Contracted to less than 10% of former range; or Less than 10% of the pre-European extent remains;
	E2	Combination of depletion, degradation, current threats and rarity is comparable overall to E1: ▪ 10 to 30% pre-European extent remains and severe degradation over a majority of this area; or ▪ naturally restricted EVC reduced to 30% or less of former range and subject to moderate degradation and/or a threatening process over a majority of remaining area; or ▪ rare EVC cleared and / or subject to moderate degradation and/or a threatening process over a majority of former area.
Vulnerable	V1	10 to 30% pre-European extent remains;
	V2	Combination of depletion, degradation, current threats and rarity is comparable overall to V1: ▪ greater than 30% and up to 50% pre-European extent remains and subject to moderate degradation and/or a threatening process over a majority of this area; or ▪ greater than 50% pre-European extent remains and severely degraded over a majority of this area; or ▪ naturally restricted EVC where greater than 30% pre-European extent remains and subject to moderate degradation and/or a threatening process over majority of this area; or ▪ rare EVC cleared and/or subject to moderate degradation and/or a threatening process over a minority of former area.
Depleted	D1	Greater than 30% and up to 50% pre-European extent remains;
	D2	Combination of depletion, degradation and current threats is comparable overall to D1, and: Greater than 50% pre-European extent remains moderately degraded over a majority of this area;
Rare	R	Rare EVC
Least Concern	LC	Greater than 50% pre-European extent remains and subject to little to no degradation over a majority of this area

Appendix 8: Seasonal relative abundances of birds at Bush's Paddock and Pinkerton Forest (combined) from BOCA data and surveys from the current study

Relative abundance in each season for birds in this table should be read in conjunction with the survey effort graphs (Figures 3 and 4 in Section '4.3.4 Analysis of BOCA bird survey data'). As some seasons are poorly represented in the data (all others apart from Spring), these seasonal compartisons may not be genuinely representative.

Common name	Scientific name	Spring	Summer	Autumn	Winter
Stubble Quail	*Coturnix pectoralis*	4	0	0	0
Black-shouldered Kite	*Elanus axillaris*	26	0	33	57
Whistling Kite	*Haliastur sphenurus*	22	75	33	29
Swamp Harrier	*Circus approximans*	4	0	17	0
Spotted Harrier	*Circus assimilis*	0	0	0	14
Grey Goshawk	*Accipiter novaehollandiae*	0	0	17	0
Brown Goshawk	*Accipiter fasciatus*	26	25	0	14
Wedge-tailed Eagle	*Aquila audax*	30	75	50	86
Little Eagle	*Hieraaetus morphnoides*	4	25	0	14
Nankeen Kestrel	*Falco cenchroides*	4	0	0	57
Brown Falcon	*Falco berigora*	26	50	50	43
Peregrine Falcon	*Falco peregrinus*	4	0	0	0
Crested Pigeon	*Ocyphaps lophotes*	26	50	33	43
Galah	*Cacatua roseicapilla*	57	50	50	100
Long-billed Corella	*Cacatua tenuirostris*	30	0	17	0
Little Corella	*Cacatua sanguinea*	4	25	17	14
Sulphur-crested Cockatoo	*Cacatua galerita*	43	0	50	43
Musk Lorikeet	*Glossopsitta concinna*	0	25	0	0
Purple-crowned Lorikeet	*Glossopsitta porphyrocephala*	0	25	0	0
Crimson Rosella	*Platycercus elegans*	4	25	33	14
Eastern Rosella	*Platycercus eximius*	65	25	83	57
Red-rumped Parrot	*Psephotus haematonotus*	70	75	83	86
Blue-winged Parrot	*Neophema chrysostoma*	0	0	0	14
Budgerigar	*Melopsittacus undulatus*	4	0	0	0
Pallid Cuckoo	*Cuculus pallidus*	13	0	0	14
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	4	25	0	14
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	13	0	0	29
Shining Bronze-Cuckoo	*Chrysococcyx lucidus*	9	0	0	0
Southern Boobook	*Ninox boobook*	4	0	0	0
Barn Owl	*Tyto alba*	13	0	0	0
White-throated Needletail	*Hirundapus caudacutus*	4	0	0	0
Laughing Kookaburra	*Dacelo novaeguineae*	30	50	17	57
Sacred Kingfisher	*Todiramphus sanctus*	13	0	0	0
White-throated Treecreeper	*Cormobates leucophaeus*	4	0	0	14
Brown Treecreeper	*Climacteris picumnus*	26	75	67	14
Superb Fairy-wren	*Malurus cyaneus*	83	100	100	100
Spotted Pardalote	*Pardalotus punctatus*	4	25	83	29
Striated Pardalote	*Pardalotus striatus*	52	50	83	57
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	52	100	100	100
Yellow Thornbill	*Acanthiza nana*	22	25	50	29
Weebill	*Smicrornis brevirostris*	0	50	0	0
Southern Whiteface	*Aphelocephala leucopsis*	4	0	0	0

Common name	Scientific name	Spring	Summer	Autumn	Winter
White-plumed Honeyeater	*Lichenostomus penicillatus*	87	75	100	100
White-naped Honeyeater	*Melithreptus lunatus*	4	0	0	0
Brown-headed Honeyeater	*Melithreptus brevirostris*	9	0	0	0
New Holland Honeyeater	*Phylidonyris novaehollandiae*	4	25	17	0
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	4	0	0	0
Red Wattlebird	*Anthochaera carunculata*	26	75	67	0
Jacky Winter	*Microeca fascinans*	87	75	100	100
Flame Robin	*Petroica phoenicea*	0	0	67	43
Varied Sittella	*Daphoenositta chrysoptera*	0	25	0	0
Eastern Shrike-tit	*Falcunculus frontatus*	17	0	0	0
Golden Whistler	*Pachycephala pectoralis*	4	0	67	43
Rufous Whistler	*Pachycephala rufiventris*	52	0	0	14
Grey Shrike-thrush	*Colluricincla harmonica*	0	25	0	29
Restless Flycatcher	*Myiagra inquieta*	0	25	0	0
Magpie-lark	*Grallina cyanoleuca*	35	75	67	71
Willie Wagtail	*Rhipidura leucophrys*	70	75	67	100
Grey Fantail	*Rhipidura albiscapa*	26	50	50	71
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	30	75	67	0
White-winged Triller	*Lalage tricolor*	17	0	0	0
Masked Woodswallow	*Artamus personatus*	4	0	0	0
White-browed Woodswallow	*Artamus superciliosus*	9	0	0	0
Dusky Woodswallow	*Artamus cyanopterus*	61	25	17	0
Australian Magpie	*Gymnorhina tibicen*	96	100	100	100
Australian Raven	*Corvus coronoides*	13	0	0	0
Little Raven	*Corvus mellori*	52	75	67	100
Singing Bushlark	*Mirafra javanica*	17	0	0	0
*Skylark	*Alauda arvensis*	30	25	17	57
Australian Pipit	*Anthus australis*	26	25	17	43
*House Sparrow	*Passer domesticus*	78	100	83	43
Diamond Firetail	*Stagonopleura guttata*	61	75	67	57
Red-browed Finch	*Neochmia temporalis*	9	25	0	0
Zebra Finch	*Taeniopygia guttata*	52	100	67	29
*European Greenfinch	*Carduelis chloris*	4	0	0	14
*European Goldfinch	*Carduelis carduelis*	26	75	33	29
Welcome Swallow	*Hirundo neoxena*	35	75	67	100
Tree Martin	*Petrochelidon nigricans*	83	75	33	71
*Common Blackbird	*Turdus merula*	17	50	50	14
*Common Myna	*Acridotheres tristis*	43	25	17	14
*Common Starling	*Sturnus vulgaris*	78	75	83	71