AN ASSESSMENT OF THE NON-VOLANT [1] MAMMAL FAUNA OF THE AREA BETWEEN DAWESVILLE AND BINNINGUP, SOUTHERN SWAN COASTAL PLAIN

Western Grey Kangaroo – Photo: B Hyder

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[1] This report only covers non-flying mammals; bats are included in a separate report (Bullen 2009)

INTRODUCTION

The Western Australia Museum (How 1978) documented the vertebrate and aquatic fauna of the northern Swan Coastal Plain between the Swan and Moore Rivers and evaluated the impact of the first 150 years of European settlement on the indigenous fauna. That study concluded that the impact of settlement had been most pronounced on the mammalian fauna. Reviewing all available data, How and Dell (1993) later stated that at the time of European settlement 16 species of non-volant (non-flying) native mammals were known from the Swan Coastal Plain and many of these species had subsequently decreased in abundance and distribution. The status of many of these species is continuing to decline as a direct result of vegetation clearing and some of these species are now absent from many parts of the Swan Coastal Plain where habitat loss and modification has been most severe.

The Museum survey documented mammals of the northern Swan Coastal Plain. However, in comparison little information is currently available on the status of mammals on the southern Swan Coastal Plain. The purpose of this report is to examine the current status of non-volant mammals on that part of the southern Swan Coastal Plain from Dawesville to the Leschenault Estuary, hereafter called the Dawesville to Binningup study area. This report reviews historic changes and considers the overall significance of the study area for mammals in the context of the wider Swan Coastal Plain Bioregion.

The Dawesville to Binningup study area is bounded by Tim's Thicket Road to the north, Buffalo Road to the south, and from the coast inland to the Old Coast Road (Figure 1). The study area encompasses Yalgorup National Park which includes major lakes (Lake Clifton and Lake Preston) of international significance, other wetlands, regionally significant Tuart woodlands, large areas of coastal heathland and shrublands, as well as patches of uncleared vegetation, semi-cleared farmlands and the coastal townships of Preston Beach, Myalup and Binningup.

This report on the non-volant mammals is part of a series of studies which assess the vertebrate fauna values of the Dawesville to Binningup study area. Other fauna groups

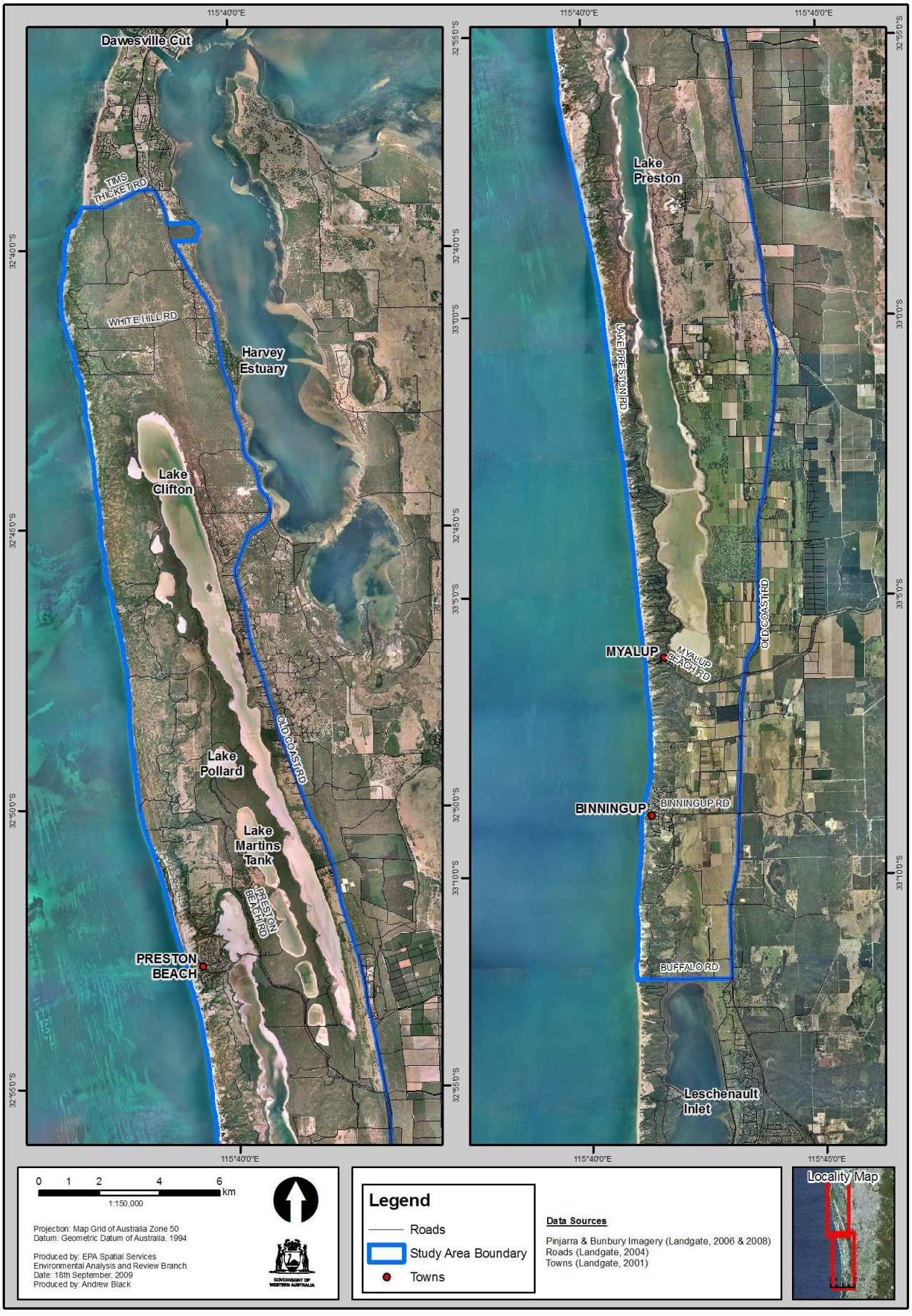

Figure 1: Map showing the Dawesville to Binningup study area.

studied include avifauna (Dell and Hyder 2009), bats (Bullen 2009) and herpetofauna (How *et al*. 2009).

METHODS

Data for this report were compiled from surveys undertaken between January and July 2009 and data collected opportunistically between 2003 and 2008, together with published and unpublished data known from the Dawesville to Binningup study area.

The 2009 survey consisted of repeated survey of twelve sites (Figure 2). These comprised five sites in the north of the study area in the Yalgorup National Park along White Hill Road, two in the middle of the study area along Preston Beach Road and a further five in the south of the area on privately owned lands in the Myalup area from the coast inland to the Old Coast Road. Survey dates were: 29-30 January, 10-13 March, 18-19 March, 4-6 May, 28-29 May, and 9 July. Sampling sites were chosen to represent the major landforms within the study area. These sites cover the Quindalup, Spearwood, Vasse and Yoongarillup Vegetation Complexes (Heddle *et al*. 1980) of the Swan Coastal Plain. Detailed descriptions of the vegetation of the survey sites are presented in Appendix 1. The survey was principally opportunistic and based on observations made during the herpetofauna (How *et al*. 2009) and bird surveys (Dell and Hyder 2009). All mammal sightings and signs were recorded. The only mammal species captured in the pitfall traps during the herpetofauna survey was the introduced House Mouse (*Mus musculus*): these animals were released at site of capture (for details on the herpetofauna survey techniques see How *et al*. 2009). Sampling was determined by the availability of funding to support the project with survey work to be completed by the end of June 2009.

The 2003-2008 data were collected opportunistically during occasional visits to the Dawesville to Binningup study area, especially around Binningup and the area south of White Hill Road as well as road transect surveys (Figure 3), often when visiting sites as part of EIA projects. During these visits all mammal sightings and signs were recorded. Sampling dates were: 30 October 2003, 25 October 2006, 14 June 2007, 5 October 2007, 16 and 17 July 2008. Additional observational records from Steve Dutton (DEC) were also used.

Figure 2: Map showing location of mammal opportunistic sites and road transects travelled during 2009 survey.

Figure 3: Map showing road transects between 2003 – 2008 mammal survey.

Records of published and unpublished literature from the area, including site-based consultant reports for development proposals were examined (see Table 1). A search was made of the specimen records in the collection of the Western Australian Museum of the mammal fauna of the area between 32^{o} 30' S and 33 ^{o} 10' S and 115 ^{o} 30'E and 115 ^{o} 50'E; and records held in the DEC Rare Fauna database was also collated. Information from the above data sources has been used to supplement information collected in our survey.

The locations of our survey sites were determined by suitability of landforms and vegetation types that reflected the dominant vegetation types. This was also constrained by limited permission to visit areas, particularly in the southern parts of the study area, where there are considerable private land holdings. The period of survey was brief, generally a few days each month, and only covered the six month period between January and June. Duration and timing was determined by the availability of funding for the project. Accordingly, the level of survey undertaken does not permit conclusions to be drawn about the total species comprising the mammal assemblages in the study area. However, information presented here is sufficient to provide a basis from which to discuss the potential significance of the study area for mammals.

RESULTS

Eight species of non-volant mammals (five native and three introduced) were recorded from the Dawesville-Binningup study area during our surveys outlined in Methods above. These are listed in Table 1 together with an additional six species (four native and two introduced) either known from the region of the study area or presumed likely to occur based on other data sources including personal observations of Steve Dutton (DEC Mandurah), surveys for Environmental Impact Assessment projects, WA Museum Records and DEC Rare Fauna list.

Table 1. Mammals recorded from the Dawesville-Binningup study area. See Annotated List for complete list of mammals known from or possibly occurring in the study area

Current Survey: dates are listed in methods and sites described in Appendix 1. WH = Whitehill Road, MY = Mylaup, W1 = Wetland near Myalup.
Other data sources are: 1=ATA (1998) for Cape Bouvard Investments Pty Ltd (Cape Bouvard); 2=Metcalf and Bamford (South Binningup) 2008 for RPS Consulting; 3=ENV Australia (2008) for Cape Bouvard Investments Pty Ltd (Clifton Beach); 4=Coffey Environments (2007) for RPS Consulting (Preston Beach); 5=Bamford Consulting Ecologists 2003 for ATA Environmental (Clifton Beach, Yalgorup); 6=Harewood 2005 for TME (northeast Binningup); 7=360 Environmental Pty Ltd 2006 for Water Corporation; 8=WA Museum Records; 9=DEC Rare Fauna list 28 May 2009; 10=Steve Dutton pers. com. (DEC Mandurah office).

	Current Survey											Other data sources									
SPECIES	WH1	WH2	WH3	WH4	WH5	MY2	MY3	MY4	MY5	W1	2003 – 2008 survey	1	2	3	4	5	6	7	8	9	10
TACHYGLOSSIDAE																					
Tachyglossus aculeatus														*							x
DASYURIDAE																					
Dasyurus geoffroii																			x	x	x
Phascogale tapoatafa																			x	x	
PERAMELIDAE																					
Isoodon obesulus[2]										x				*				*	x	x	
MACROPODIDAE																					
Macropus fuliginosus	x	x	x	x	x	x	x	x	x	x	x[3]	*	*	*	*	*	*	*	x		
Macropus irma									x										x		
PHALANGERIDAE																					
Trichosurus vulpecula			**x**	**x**				**x**	**x**	**x**		*	*	*	*	*	*	*	**x**		
PSEUDOCHEIRIDAE																					
Pseudocheirus occidentalis[4]								x	x	x	[5]x							*			
BURRAMYIDAE																					
Cercartetus concinnus																			x		
MURIDAE																					
Mus musculus	x							x	x			*	*	*	*	*			x		
Rattus rattus												*							x		
CANIDAE																					
Vulpes vulpes	x									x	x		*	*	*	*		*			
FELIDAE																					
Felis catus												*	*			*	*				
LEPORIDAE																					
Oryctolagus cuniculus	x	x	x	x	x	x	x	x	x	x	x	*	*	*	*	*		*			

Note: Incidental records of pig, dog and goat in EIA assessment reports are likely to be domestic escapees and not included in this table.

[2] Also recorded at Preston Beach Road during the current survey.
[3] Recorded at numerous sites in the study area.
[4] Also recorded at Binningup Golf Course during the current survey.
[5] Recorded west side of Lake Clifton.

In addition to the 14 species listed in Table 1, eight other species (seven native and one introduced) are likely to have previously occurred in the Dawesville-Binningup study area, based on current and or previous known distributions. Presented below is a list of the 22 species currently known from or likely to have occurred in the Dawesville-Binningup study area. For each species its conservation significance is stated and its likely status is summarised based on the data available. Data from our survey are then outlined, followed by a summary of other data known from the study area (e.g. recent consultant reports for development proposals in the study area), and then consideration of the conservation significance of populations in the study area. Introduced species are indicated by *.

ANNOTATED LIST

Family TACHYGLOSSIDAE

Tachyglossus aculeatus Short-beaked Echidna

Conservation significance: Category 3 (Table 2). Status in study area uncertain. Recorded west of Lake Clifton (ENV 2008), around Martins Tank (Steve Dutton pers. com. 2009) and two road kills on the Old Coast Road in the last 10 years (Steve Dutton pers. com. 2009). The Short-beaked Echidna has declined in urban and peri-urban areas on the Swan Coastal Plain, for example the last known record for Short-beaked Echidna in the western suburbs of Perth was 1985 in the Bold Park area (How and Dell 1990).

Family DASYURIDAE

Dasyurus geoffroii Chuditch

Conservation significance: Vulnerable, Schedule 1, Category 3 (Table 2). Status; uncertain in study area, known to occur in Yalgorup National Park north-east of Lake Clifton. There is a record of a sub-adult male (road kill) in 1994 in the National Park (DEC Rare Fauna list 2009). In May/June 1995 CALM undertook a Chuditch trapping programme setting up 40 traps in a 200m grid along an existing track. Five adult males were caught over a five year trapping period (Steve Dutton pers. com. 2009).

Phascogale tapoatafa (WAM M434) Brush-tailed Phascogale

Conservation significance: Vulnerable, Schedule 1, Category 3 (Table 2). Status uncertain in study area. There is a record in the study area at Lake Clifton (WA Museum database 1991) and three records outside the study area: two individuals in the vicinity of Mandurah (WA Museum database 1962 and 1990), and a record to the north-east of the study area (DEC rare fauna database 2009). This species probably persists in low numbers in the more extensively vegetated parts of the study area.

Sminthopsis griseoventer Grey-bellied Dunnart

Conservation Significance: Category 3 (Table 2). Status unknown in study area. Once known to be widespread in the south west including several localities on the Swan Coastal Plain (Kitchener *et al*. 1978). The lack of systematic surveys on the southern Swan Coastal Plain precludes any consideration of its previous or current distribution in this region.

Family PERAMELIDAE

Isoodon obesulus Quenda

Conservation significance: Priority 5, Category 4 (Table 2). Recorded from widespread locations in the study area. Numerous diggings and runways in the wetland W1 (see Figure 2) and near Preston Beach Road were recorded in 2009. Individuals were also recorded to the west of Lake Clifton and north of Binningup by ENV (2008) and 360 Environmental Pty Ltd (2006) respectively.

Family POTOROIDAE

Bettongia penicillata Woylie

Conservation significance: Schedule 1 (Table 2). Regionally extinct. At the time of European settlement it was widespread on the southern Swan Coastal Plain (see map in de Tores and Start 2008).

Family MACROPODIDAE

Macropus eugenii Tammar Wallaby

Conservation significance: Priority 5 (Table 2). Status unknown in the study area but likely to be regionally extinct except for the Garden Island population to the north of the study area. At the time of European settlement it was widespread on the northern Swan Coastal Plain (see map in Hinds 2008).

Macropus fuliginosus Western Grey Kangaroo

Common throughout the study area. Recorded at all survey sites and locations examined during the present survey and during all previous environmental impact assessment surveys.

Macropus irma Western Brush Wallaby

Conservation significance: Priority 4, Category 3 (Table 2). Status uncertain in study area. Only one recorded during the present survey, in March at Site MY5. In 1843 Gilbert wrote this species "is found inhabiting scrubby country (and) appears to be pretty generally distributed over the whole Country yet settled upon or known to the settlers" (Whittell 1954). Shortridge (1909) and Glauert (1933) reported that there was no evidence of population decline and the species was still common near Perth. However, How and Dell (1993) reported the decline over the previous 14 years of the Western Brush Wallaby in the Perth Metropolitan Region of the Swan Coastal Plain, which then only persisted in larger remnants that had been recently isolated from larger tracts of native bushland peripheral to the main urban areas.

Setonix brachyurus Quokka

Conservation significance: Vulnerable, Schedule 1, Category 3 (Table 2). No recent records within the study area but has been recently recorded south of the study area at Muddy Lakes (Dell and Hyder-Griffiths 2002, Sinclair and Hyder 2008). The Quokka has suffered a considerable decline in abundance and distribution since European settlement, the contraction being greatest from the northern extent of its geographic distribution including the Swan Coastal Plain (de Torres *et al*. 2007). The Quokka was considered absent from the Swan Coastal Plain until it was recorded at Muddy Lakes in 2002. Based on suitable habitat being present in the study area and its known distribution to the south of the study area this species may be present in suitable habitats in the dense fringes around Lake Clifton and Lake Preston.

Family PHALANGERIDAE

Trichosurus vulpecula Common Brushtail Possum

Conservation significance: Category 4 (Table 2). Widespread throughout the study area. Scats were recorded at Sites WH3, WH4, MY4, MY5 and W1. Common Brushtail Possums were also recorded during each of the following surveys: Alan Tingay and Associates (1998); Bamford Consulting Ecologists 2003; ENV Australia (2008) Coffey Environments (2007); Metcalf and Bamford 2008; Harewood 2005; 360 Environmental Pty Ltd. 2006. This species is frequently seen dead on the Old Coast Road. The habitats in the study area are the most continuous on the Swan Coastal Plain and provide a large reliable source of food and shelter for this species. The continous population is likely to provide gene flow throughout the study area, so helping to retain a strong genetic pool in the region.

Family PSEUDOCHEIRIDAE

Pseudocheirus occidentalis Western Ringtail Possum

Conservation significance: Vulnerable, Schedule 1, Category 3 (Table 2). Western Ringtail Possum scats were recorded at Sites MY4, MY5 and W1, and adjacent to Binningup Golf Course. Between 2005 and 2008, 31 sightings and signs were recorded across the study area (DEC Rare Fauna list 2009). Between 1995 and 2005 DEC released 205 Western Ringtail Possums at three translocation sites within Yalgorup National Park, namely Preston Beach Road, White Hill Road and Martins Tank/Lake Pollard. Subsequent monitoring has confirmed these populations have survived with continued recruitment of young (de Tores *et al*. 2004).

Family BURRAMYIDAE

Cercartetus concinnus Western Pygmy-possum

Conservation significance: Category 3 (Table 2). Status unknown in study area. There are no records from any recent surveys within the study area, however there is an undated record of an individual outside the study area in the Mandurah area (undated specimen WA Museum database). The lack of systematic surveys on the southern

Swan Coastal Plain precludes any consideration of its previous or current distribution in this region.

Family TARSIPEDIDAE

Tarsipes rostratus Honey Possum

Conservation significance: Category 3 (Table 2). Status unknown in study area. Based on known distributions both to the north and south of the study area this species may be present within the study area. The lack of systematic surveys on the southern Swan Coastal Plain precludes any consideration of its previous or current distribution in this region.

Family MURIDAE

Hydromys chrysogaster Water-rat

Conservation significance: Priority 4, Category 3 (Table 2). Status unknown in study area. It was recorded south of the study area at Muddy Lakes (Dell and Hyder-Griffiths 2002) and there is an undated record of an individual to the north of the study area near Yunderup (undated specimen WA Museum database). Based on known distribution (undated specimen WA Museum database) this species may be present within the study area in suitable habitat, e.g. along the Harvey Main Drain.

**Mus musculus* House Mouse

Widespread throughout the study area. Recorded during most fauna surveys.

**Rattus rattus* Black Rat

Status unknown in study area. Recorded in the study area west of Lake Clifton (Alan Tingay and Associates 1998).

Family CANIDAE

Canis lupus dingo Dingo

Regionally extinct. At the time of European settlement it was widespread on the Swan Coastal Plain (see map in Corbett 2008).

*_Vulpes vulpes_ Red Fox

Recorded throughout the study area. Foxes were recorded at Site WH1, W1 and in vicinity of White Hill Road during present survey; and Clifton Beach, Yalgorup National Park (Bamford Consulting Ecologists 2003 and ENV Australia 2008); Preston Beach (Coffey Environments 2007); Binningup area (Metcalf and Bamford 2008 and 360 Environmental Pty Ltd 2006).

Family FELIDAE

*_Felis catus_ Cat

Widespread throughout the study area. Recorded west of Lake Clifton (Alan Tingay and Associates 1998); south Binningup (Metcalf and Bamford 2008); Clifton Beach, Yalgorup National Park (Bamford Consulting Ecologists 2003); and northeast of Binningup (Harewood 2005).

Family LEPORIDAE

*_Oryctolagus cuniculus_ Rabbit

Widespread throughout the study area. Recorded at all survey sites during the present survey and during all previous environmental impact assessment surveys.

Family SUIDAE

*_Sus scrofa_ Pig

Status unknown in study area. Reported sightings in pine plantations to the east of the study area near Forestry Road, but no confirmed records within the study area.

DISCUSSION

Excluding bats (covered in Bullen 2009) the Dawesville to Binningup study area historically has records of 22 species of mammals, comprising 16 native and six introduced species. Of the native species, only seven were recorded during either the current or recent surveys. However, there has been no comprehensive survey of the mammal fauna in the study area and it is likely that such a survey would record

additional species, particularly less easily observed or captured species (e.g. Honey Possum, Pygmy Possum, Brush-tailed Phascogale and Grey-bellied Dunnart).

The majority (15 species) of the 22 native mammal species known from, or likely to occur in the study area are regionally conservation significant. These species and the categories of conservation significance are listed in Table 2. Of the five species of native non-volant mammals recorded during the current study, three species are of conservation significance: Western Ringtail Possum Vulnerable (EPBC Act 1999) Schedule 1 (Government of Western Australia 2008) Western Brush Wallaby DEC Priority 4 and Quenda DEC Priority 5.

At least three of the larger species, Woylie, Tammar Wallaby (excluding Garden Island) and Dingo, are already presumed extinct on the Swan Coastal Plain. Little is known about the current distributions of many of the smaller mammal species on the Swan Coastal Plain. Areas where detailed sampling data are available (e.g. How and Dell 1993 and 2000) indicate that in highly modified areas such as the Perth Metropolitan Region most small mammals are locally extinct. These authors showed that the most dramatic consequence of urbanisation and fragmentation has been the almost total local extinction of native mammals across all landforms and vegetation remnants in urban areas.

Compared to the reductions in distribution and abundance in most mammal species on the southern Swan Coastal Plain, the Western Grey Kangaroo appears to have increased significantly in localised areas within the study area where bushland and farmland occur in close proximity.

Six introduced mammal species occur in the study area: House Mouse, Black Rat, Fox, Cat, Rabbit and Pig. Impacts including competition, predation and disturbance by these species with or on the native mammals is poorly documented on the Swan Coastal Plain including in the study area. In particular, the impacts of competition by the House Mouse (a species which has large population cycles) on native species has not been determined. The impact of the introduced predators, cats and foxes, on native wildlife was highlighted by Kitchener *et al*. (1978) who proposed this as one of the

major factors in mammal declines. They noted that 37 mammal species in the collection of the WA Museum had been caught by cats.

TABLE 2: Conservation significant non-volant mammals known from or likely to occur in the Dawesville to Binningup study area

KEY:

Conservation Significance

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (DEH 2005)
  E = Endangered
  VU= Vulnerable
- *Wildlife Conservation (Specially Protected Fauna) Notice 2008* (Government of Western Australia 2008)
  S1 = Schedule 1 — being fauna that is rare or likely to become extinct
- DEC Priority Fauna List (DEC 2008),
  P1-P5 = Priority 1 – Priority 5
- Regionally declining species, although not formally listed the status of these species is inferred from the text in Government of Western Australia (2000)
  Category 3 = species with a reduced distribution on the Swan Coastal Plain and the Dawesville/Binningup study area
  Category 4 = species with reduced populations on the Swan Coastal Plain and the Dawesville/Binningup study area

Scientific Name	Common Name	Conservation Significance
MAMMALS		
Tachyglossus aculeatus	Short-beaked Echidna	Category 3
Dasyurus geoffroii	Chuditch	VU, S1, Category 3
Phascogale tapoatafa	Brush-tailed Phascogale	VU, S1, Category 3
Sminthopsis griseoventer	Grey-bellied Dunnart	Category 3
Isoodon obesulus	Quenda	P5, Category 4
Bettongia penicillata	Woylie	S1 (regionally extinct)
Macropus eugenii	Tammar Wallaby	P5 (regionally extinct)
Macropus irma	Western Brush Wallaby	P4, Category 3
Setonix brachyurus	Quokka	VU, S1, Category 3
Trichosurus vulpecula	Common Brushtail Possum	Category 4
Pseudocheirus occidentalis	Western Ringtail Possum	VU, S1, Category 3
Cercartetus concinnus	Western Pygmy-possum	Category 3
Tarsipes rostratus	Honey Possum	Category 3
Hydromys chrysogaster	Water Rat	P4, Category 3
Canis lupus dingo	Dingo	(regionally extinct)

SIGNIFICANCE OF STUDY AREA FOR MAMMALS

Habitats within the Dawesville to Binningup study area are of regional significance for mammals, particularly for those species and assemblages that have greatly reduced distributions or have declined in abundance elsewhere on the Swan Coastal Plain. The potential for the survival of mammal populations on remnants to the north outside the study area on the Swan Coastal Plain is limited due to impacts from high density development, with the associated environmental consequences of increased fragmentation, fire frequency and predation. Accordingly, the more extensive and diverse tracts of habitats in the Dawesville to Binningup study area have great conservation significance for mammal conservation on the Swan Coastal Plain. Even in those parts of the study area where the native vegetation is fragmented by farmland, movement of fauna between larger habitat areas may be facilitated by the use of ecological linkages connecting smaller areas of remnant vegetation with larger habitat areas. Additionally, habitats in the study area have additional values as they have potential for reintroductions of those species which have become locally or regionally extinct. This is exemplified by the successful reintroduction of Western Ringtail Possums in the northern part of the study area.

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APPENDIX 1

HABITAT DESCRIPTIONS AND GPS READINGS

GPS readings are presented in degrees and decimal minutes using Datum WGS 84

WHITE HILL [WH] ROAD - NORTHERN SITES

WH1 32 41.399S 115 36.665E

Stratum 1 1.5-2 m 30-70% *Spyridium globulosum, Olearia axillaris* and *Acacia rostellifera*.

Stratum 2 <0.5 m 2-10% *Lomandra* sp. and at least 5 other species.

Leaf litter sparse clumped to 2 cm deep under shrubs. Narrow leaves. No evidence of fire.

Note: part of site in more wind-swept aspect has lower vegetation cover.

WH2 32 41.353S 115 37.004E

Stratum 1 1.5-2 m 70-100% Mixed shrubland with *Acacia rostellifera, Olearia axillaris, Spyridium globulosum* and *Melaleuca ?acerosa* dominants.

Stratum 2 <0.5 m 30-70% *Lomandra* sp. and at least 5 other species.

Leaf litter sparse, clumped to 5 cm deep under shrubs. Narrow leaves. No evidence of fire.

WH3 32 41.361S 115 37.299E

Stratum 1 8-10 m 2-10% *Eucalyptus gomphocephala*.

Stratum 2 6-8 m 10-30% *Agonis flexuosa* and occasional *Banksia attenuata* and *Dryandra sessilis.*

Stratum 3 1.5-2 m 10-30% *Xanthorrhoea preissii,* and *Spyridium globulosum.*

Stratum 4 <1 m ca12% *Hibbertia hypericoides* and *Hakea lissocarpha.*

Leaf litter continuous 2-5 cm deep, clumped deeper under shrubs. Broad leaves and a few logs, numerous dead *Xanthorrhoea*. Last burnt: greater than 10 years.

WH4 32 41.419S 115 38.237E

Stratum 1 8-12 m ca. 2% *Eucalyptus gomphocephala* and *Eucalyptus marginata.*

Stratum 2 5-8 m 10-30% *Banksia attenuata.*

Stratum 3 1-1.5 m 30-70% *Melaleuca* sp*., Hibbertia hypericoides,* and occasional *Hakea lissocarpha* and *Olearia axillaris*.

Leaf litter continuous < 2 cm deep, clumped deeper under shrubs. Broad leaves and some logs. Last burnt: greater than 10 years.

WH5 32 41.301S 115 38.871E

Stratum 1 5-8 m 30-70% *Banksia attenuata, Allocasuarina fraseriana, Zylomelum occidentalis, Agonis flexuosa* and *Eucalypyus marginata* with occasional *E. gomphocephala* and *Corymbia calophylla* emergent to 12 m.

Stratum 2 <1 m 10-30% *Hibbertia hypericoides, Stirlingia* sp., *Macrozamia riedlei, Hakea lissocarpha.* Several other species.

Leaf litter almost continuous 2-4 cm deep, clumped deeper under shrubs. Broad and narrow leaves and some logs. Old logging signs. Last burnt: greater than 4 years.

MYALUP [MY] AREA - SOUTHERN SITES

MY2 33 05.938S 115 41.635E

Stratum 1 5-8 m 10-30% *Agonis flexuosa. Eucalyptus gomphocephala* emergent to 12 m.

Stratum 2 2-3 m 10-30% *Spyridium globulosum* and occasional *Hakea prostrata.*

Stratum 3 <0.5 m 2-10% *Acanthocarpus preissii, Lomandra* sp. and at least 6 other species.

Leaf litter continuous 3-5 cm deep, clumped to 12cm under shrubs. Broad and narrow leaves. Small logs and dead twigs abundant. No recent evidence of fire.

Note: Parts of site are more open and *Lomandra* is more abundant and *Acanthocarpus* less abundant.

MY3 33 06.340S 115 41.818E

Stratum 1 15-20 m 10-30% *Eucalyptus gomphocephala* some mature with large hollows, others immature.

Stratum 2 5-8 m 2-10% *Agonis flexuosa.*

Stratum 3 2-4m 30-70% *Spyridium globulosum* and occasional *Acacia saligna* and *A. cyclops* and *Hardenbergia comptoniana.*

Stratum 4 <0.5 m 70-100% *Acanthocarpus preissii, Lomandra* sp. and a few other species. Abundant dead grass.

Leaf litter almost continuous 2-5 cm deep, clumped to 12 cm under shrubs. Broad and terete leaves. Large logs and dead twigs abundant. No recent evidence of fire.

Note: Parts of site are more open and dead grass is more dense.

MY4 33 06.973S 115 42.632E

Stratum 1 10-15 m 2-10% *Eucalyptus gomphocephala, E. marginata, Corymbia calophylla.*

Stratum 2 4-10 m 30-70% *Banksia attenuata, Agonis flexuosa, B. grandis.*

Stratum 3 <1m 30-70% *Hibbertia hypericoides, Xanthorrhoea preissii, Desmocladus* sp. and other mixed species.

Leaf litter continuous 2-5 cm deep, clumped to 10 cm under shrubs. Broad leaves. Logs and dead twigs abundant. No recent evidence of fire.

MY5 33 07.584S 115 43.016E

Stratum 1 10-15 m 2-10% *Corymbia calophylla, Eucalyptus marginata*.

Stratum 2 6-8 m 30-70% *Banksia attenuata, B. grandis, Agonis flexuosa, Eucalyptus marginata, Corymbia calophylla,* and occasional *Banksia ilicifolia.*

Stratum 3 <1m 10-30% *Hibbertia hypericoides* and other mixed species.

Leaf litter continuous 3-5 cm deep, clumped to 12 cm under shrubs. Broad leaves. Logs and dead twigs abundant. No recent evidence of fire.

WETLAND [W]

W1 33 06.861S 115 42.169E

Outer Zone

Stratum 1 15-20 m 2-10% *Eucalyptus gomphocephala*.

Stratum 2 8-12 m 70-100% *Agonis flexuosa.*

Stratum 3 1-1.5 m 70-100% *Lepidosperma longitudinale*.

Leaf litter continuous 5-10 cm deep. Broad leaves. Large to medium logs abundant. No recent evidence of fire.

Inner Zone

Stratum 1 5-10 m 70-100% *Melaleuca rhaphiophylla*.

Stratum 2 1-1.5 m 30-70% *Lepidosperma longitudinale, Restio* sp.

Leaf litter continuous 3-5 cm deep. Narrow leaves. Large to medium logs abundant. No recent evidence of fire.

Note: Parts of site with deeper seasonal water are more open and sedges are less abundant.

MIXED WOODLAND [MW]

MW1 32 53.256S 115 41.112E

Stratum 1 8-12 m 2-10% *Eucalyptus marginata* and occasional *Corymbia calophylla* and *Eucalyptus gomphocephala*.

Stratum 2 5-7 m 30-70% *Banksia attenuata* and occasional *Agonis flexuosa.*

Stratum 3 <1m 30-70% *Hibbertia hypericoides* and other mixed species.

Leaf litter sparse, few logs. Recent evidence of fire.

LIMESTONE SHRUBLAND [LS]

LS1 32 50.07S 115 39.12E

Stratum 1 1.5-2 m 70-100% Mixed shrubland with *Acacia rostellifera, Olearia axillaris, Spyridium globulosum* and *Melaleuca ?acerosa* dominants.

Stratum 2 <0.5 m 30-70% *Lomandra* sp. and at least 5 other species.

Leaf litter sparse, clumped to 5 cm deep under shrubs. Narrow leaves. No evidence of fire.