



### Forest Products Commission (FPC) - Fauna monitoring program in the Karri forest – 2017

In order to ensure that the fauna monitoring program is effective, it is essential to review progress against the performance indicators and measures that were established at the beginning of the program. This allows the evaluation of progress towards achieving the objectives of the program and the identification of any areas requiring modification or improvement. Table 1 summarises the objectives, targets and performance measures that have been established for the fauna monitoring program, as well as an evaluation of progress against these.

**Table 1: Evaluation of progress against the objectives, targets and performance measures, following implementation of the fauna monitoring program in 2016.**

Objective	Target	Performance Measure	Progress as at June 2017
Objective 1: To determine the presence of threatened or priority listed species within areas of karri forest planned for timber harvesting;	Continue to implement a fauna monitoring program that maximises detection probability for species likely to be present within coupes.	Fauna monitoring program implemented prior to areas being harvested in 2016/2017.	The program was implemented in 2016/2017 (September 2016-June2017) prior to areas being harvested. The species considered likely to occur within the karri forest and the monitoring strategies applied are presented in Table 2.
Objective 2: To use the outcomes of surveys to assist with development of management objectives;	Use outcomes from fauna surveys to refine management responses in consultation with Parks and Wildlife.	Management actions modified as necessary to reduce impacts on threatened species. E.g. retention of hollows, consideration of access alignments and harvest boundaries.	Threatened species were detected in all of the surveyed coupes (18). Management actions were recommended for each of these coupes and included requirements such as: protection of riparian habitat, post-harvest predator control, exclusion of additional critical elements of habitat for cockatoos and western ringtail possums (See Table 3 for full details).



**Table 1: Continued**

Objective	Target	Performance Measure	Progress as at June 2017
Objective 3: To improve the functionality of the Fauna Distribution Information System;	Implement the agreed upon process for using fauna survey outcomes to improve and/or validate FDIS	Provision of fauna capture data as a geo-referenced spreadsheet to allow upload of this data into threatened species data sets, prior to the end of 2017.	All capture records were provided in the required format to Species and Communities Branch at the completion of the fauna survey program.
	Objective 4: To build and maintain internal knowledge and skills relevant to fauna monitoring and biodiversity management within proposed harvest areas.	Maintain a record of skills, experience and competency levels of trained personnel.	Record system updated to reflect training and competencies, consistent with FPC requirements.
Objective 5: To ensure approaches to monitoring remain contemporary, relevant and credible.	Actively address personnel skill and experience shortfalls through targeted training.	Delivery of field training or formal training sessions relevant to the 2017 fauna monitoring program.	A full training session was delivered for three trainees in July 2016 prior to commencement of the 2016/2017 survey program. Multiple field training sessions have been delivered between Sept 2016 and June 2017 to enable individuals and their competencies to be targeted.
	Evaluation of monitoring procedures annually, including review of target species and new literature	Summary to be included in annual review of the fauna monitoring program, with a focus on areas requiring modification.	The monitoring procedures were effective at detecting the species identified in Table 3. These procedures are still consistent with best practice and contemporary approaches in the literature for the survey of threatened species. The fauna lists have been reviewed and modifications made in relation to nomenclature changes and conservation status changes that have occurred in the past 12 months.
	Evaluation of effectiveness of training	Field evaluation of skills in habitat tree retention, camera trap establishment, indirect fauna monitoring	Three trainees were evaluated in the field and competency assessments completed.

Table 2 presents a summary of the threatened fauna species that were considered most likely to occur in the karri forest for the 2016/2017 survey. This list was prepared following review of threatened species lists and in consultation with personnel from the Department of Parks and Wildlife. The list of target species for survey is updated annually to reflect any changes to the threatened species lists or knowledge of species occurrences and habitat preferences. There have been a number of changes to the threatened species list in the past 12 months, including: Western Ringtail Possum has had a status change from EN to CR; there has been a name change for the South-western Brush-tailed Phascogale (*Phascogale tapoatafa subsp.*) The nomenclature for this species is now *Phascogale tapoatafa wambenger*; the South-western Brush-tailed Phascogale status has changed from VU to CD (conservation dependent, schedule 6); the Tingle Trapdoor Spider has had a nomenclature and status review and is now formally the Western Pygmy Trapdoor Spider' (*Bertmainius opimus*) and is listed as P3; the South-west Carpet Python (*Morelia spilota imbricata*) has been removed from the list.

**Table 2: Fauna species targeted for fauna monitoring in the karri forests, with a summary of their ecology and strategies for maximising detection.**

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Mammals</i>			
Brush-tailed Phascogale ( <i>Phascogale tapoatafa wambenger</i> ) 	CD	The brush-tailed phascogale is a nocturnal, solitary, medium-sized dasyurid that forages mostly in the canopy between sunset and sunrise (Traill and Coates 1993; Scarff <i>et al.</i> 1998, Scarff and Bradley 2006). Phascogales rarely forage on the ground (Scarff and Bradley 2006). Individuals use multiple nest trees within their variable home range of 5-150 ha, with nests generally located in trees >80 cm diameter at breast height (Soderquist 1995, van der Ree <i>et al.</i> 2001, 2006). Breeding season varies little throughout their range, with most births occurring in July. Young are carried with the mother for the first 48 days and are thereafter left in the nest (van der Ree <i>et al.</i> 2006).	Arboreal camera surveys and search for tree hollows.
Chuditch ( <i>Dasyurus geofroii</i> ) 	VU	Chuditch utilise horizontal hollow logs or earth burrows as dens or refuge. To be suitable as den sites, logs must have a diameter > 30 cm and a hollow with 7-20 cm diameter and a minimum length of 1 m (Serena and Soderquist 1989, Dunlop and Morris 2008, McGregor <i>et al.</i> 2014). Annually, an adult female Chuditch will utilise an estimated average of 66 logs and 110 burrows within her home range (Orell and Morris 2004).	Camera survey and indirect surveys for faecal material and dens.

**Table 2:** continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Mammals continued</i>			
Numbat ( <i>Myrmecobius fasciatus</i> ) 	VU	The numbat is a small termitivorous marsupial, with a distribution currently limited to two naturally occurring remnant populations in WA and to several smaller re-introduced populations in New South Wales, South Australia and WA (Friend and Thomas 2003). This species nests in hollow logs or in burrows (Friend 1989) and is most likely to occur in mixed jarrah/ karri forest. There are few records of this species in the karri forest (Peacock 2006) and an abundance of termites appears to be a prerequisite for the occurrence of this species (Friend and Thomas 2003).	Camera survey and indirect surveys for faecal material, feeding patterns in termite mounds and dens.
Quenda ( <i>Isoodon obesulus fusciventer</i> )  Photo: K. Bain Walpole	P5	Quenda inhabit a variety of habitats including forests, woodlands, shrub and heath (Van Dyck and Strahan 2008). The main habitat requirement is for dense cover at ground level (Maxwell et al. 1996, Van Dyck and Strahan 2008). For shelter this species builds a nest consisting of leaf litter over a shallow depression concealed next to or under logs, shrubs or piles of debris. They will also use burrows of other species (Braithwaite 1995, Long 2009).	Camera survey and indirect surveys for diggings and runnels.
Quokka ( <i>Setonix brachyurus</i> )  Photo: K. Bain Walpole	VU	Quokkas inhabit a variety of habitats in the southern forest, including woodland, forest, coastal heath, thicket and riparian vegetation. Low density of woody debris, complex vegetation structure (minimum of 3 layers) and habitat heterogeneity are important factors driving occupancy in the karri forest (Bain <i>et al.</i> 2015). This species can be readily detected through faecal pellets (Bain <i>et al.</i> 2014).	Camera surveys and indirect surveys for faecal material and runnels.
Tammar Wallaby ( <i>Macropus eugenii derbianus</i> )  Photo: Parks and Wildlife	P5	The Tammar Wallaby is currently known from several sites in the southern forests including forests near Perup, east of Manjimup (reintroduced) and north of Walpole (reintroduced) (Parks and Wildlife 2012). The species inhabits heath, dry sclerophyll forest and thickets in mallee and woodland (Poole <i>et al.</i> 1991) and there are currently no records of occurrence within the wet karri ecotypes (Naturemap 2015).	Camera survey and indirect surveys for faecal material.

**Table 2:** continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Mammals continued</i>			
Water Rat ( <i>Hydromys chrysogaster</i> )  Photo: Narrandera Birding	P4	The Water Rat occupies a wide variety of freshwater habitats with a diversity of structural habitats, including dense riparian vegetation, sunken logs and roots (Smart <i>et al.</i> 2011; Speldewinde <i>et al.</i> 2013). They sleep in a burrow in the bank of a creek with the entrance hidden under roots or in a hollow log. They spend the majority of their life within and adjacent to riparian systems and feeding activities leave visible remains of crustaceans and molluscs (Cronin 1996).	Unlikely to occur within the forest, however camera survey and indirect survey for evidence of feeding will detect this species if it is present.
Western Brush Wallaby ( <i>Macropus irma</i> ) 	P4	The Western Brush Wallaby is found in open forest and woodland, particularly with open, seasonally-wet flats, low grasses and open scrubby thickets (Morris and Christensen 2008). It is less common in karri forest (Maxwell <i>et al.</i> 1996, Morris and Christensen 2008).	Camera survey and indirect surveys for faecal material.
Western False Pipistrelle ( <i>Falsistrellus mackenziei</i> )  Photo: Lochman Transparencies	P4	The Western False Pipistrelle lives mainly in wet sclerophyll forests of Karri, Jarrah and Tuart. They roost in hollows in old trees, branches and stumps, in colonies of 5 to 30 bats (Start and McKenzie 1995, Churchill 1998).	Call surveys and search for tree hollows.
Western Ringtail Possum ( <i>Pseudocheirus occidentalis</i> )  Photo: K. Bain Busselton	CR	The Ringtail Possum occurs in the coastal strip between Bunbury and Albany and in the Upper Warren region (Perup Nature Reserve, Greater Kingston National Park and adjacent state forest) (Wayne <i>et al.</i> 2006, Parks and Wildlife 2014). The species mostly feeds and moves in the canopy (Wayne <i>et al.</i> 2005). The subpopulation in the southern forests occurs mainly in Jarrah, Marri or Karri dominated forests (Parks and Wildlife 2014), where animals feed on myrtaceous leaves (Smith 1983) and occupy tree hollows (Jones <i>et al.</i> 1994, Wayne <i>et al.</i> 2000, Wayne <i>et al.</i> 2005).	Arboreal camera surveys and search for tree hollows, leaf browsing, tree scratching and faecal material.

**Table 2: continued**

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Mammals continued</i>			
<p>Woylie (<i>Bettongia penicillata ogilbyi</i>)</p> 	CR	<p>The range of the woylie has declined by more than 99%, and it is now restricted to four remnant natural populations in the south-west of Western Australia, two of which are associated with the Upper Warren (Start <i>et al.</i> 1995, Pacioni <i>et al.</i> 2010). Woylies are primarily mycophagous, feeding extensively on the hypogeous fruiting bodies of ectomycorrhizal fungi (Christensen 1980; Claridge and Barry 2000, Garkaklis <i>et al.</i> 2003). While foraging for underground fungi, woylies make numerous small diggings that are distinctive.</p>	<p>Camera survey and indirect surveys for faecal material and diggings.</p>
<i>Birds</i>			
<p>Barking Owl (<i>Ninox connivens</i>)</p>  <p>Photo: K. Bain Walpole</p>	P2	<p>The Barking Owl occurs in riparian forests and woodlands (Kavanagh <i>et al.</i> 1995, Shelly 2006). The species nests in large hollows (Schodde and Mason 1980, Shelly 2006) between July and October, with chicks hatching after 36 days (Robinson 1994, Clemann and Loyn 2003).</p>	<p>Call surveys and search for tree hollows.</p>
<p>Baudin's Cockatoo (<i>Calyptorhynchus baudinii</i>)</p>  <p>Photo: Johnstone and Kirkby 2015</p>	EN	<p>Baudin's cockatoo occurs in tall forests and woodlands, where it feeds mainly on Marri seeds and various Proteaceous species (Johnstone and Kirkby 2011). The species breeds in large hollows (Chapman 2008, Johnstone and Kirkby 2008) with peak breeding season occurring in October-December. Incubation lasts for about 29 days and chicks remain in the nest for up to 16 weeks (Bohner 1984, Johnstone and Kirkby 2008). To be suitable, hollows need to have an entrance diameter of 30–40 cm (Saunders 1979, Johnstone and Storr 1998).</p>	<p>Call surveys and search for tree hollows.</p>

**Table 2:** continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Birds continued</i>			
Masked Owl <i>(Tyto novaehollandiae novaehollandiae)</i> 	P3	The Masked Owl occurs in open forests and woodlands and riparian woodlands (Debus 1993). Nests are usually in large hollows within the trunk or near-vertical spouts of tall eucalypt trees (Kavanagh 1996, D’Ombraïn 2002). Breeding for this species has been documented in March-October with chicks hatching after an incubation of 35-42 days (Kavanagh 1996).	Call surveys and search for tree hollows.
Photo: Parks and Wildlife Walpole			
Forest Red-tailed Black Cockatoo <i>(Calyptorhynchus banksii naso)</i> 	VU	The Forest Red-tailed Black Cockatoo occurs in Marri, Karri and Jarrah forests, woodlands and remnants in the south-west of Western Australia and feeds mainly on the seeds of Marri, Jarrah, Sheoak, and Snottygobble (Chapman 2008, Johnstone <i>et al.</i> 2013a). The species has an obligate dependence on hollows in live standing trees (Abbott 1998, Johnstone <i>et al.</i> 2013a, b) and birds tend to select hollows that are high and deep, with a mean entrance diameter of 30 cm (Johnstone <i>et al.</i> 2013a). Breeding has been recorded in every month with peaks in April-June and August-October (Johnstone <i>et al.</i> 2013b). The female incubates for about 29 days and chicks remain in the nest for about 48 days (Johnstone <i>et al.</i> 2013b).	Call surveys and search for tree hollows.
Photo: Tony Kirkby			
<i>Invertebrates</i>			
Western Pygmy Trapdoor Spider’ <i>(Bertmainius opimus)</i> 	P3	The Western Pygmy Trapdoor Spider is found in mesic habitats including karri and tingle forests in the south west of WA (Main 1991). The species makes shallow burrows in the bark of karri and tingle trees and in the mossy banks of creeks. Moggridgea is currently undergoing a taxonomic revision and will be renamed to Bertmainius, whereupon the species will be split into seven species, one of which ( <i>B. opimus</i> ) is restricted to the karri forests between Walpole and Augusta (Harvey <i>et al.</i> in press).	Burrow searches
Photo: K. Bain			



Table 3 provides a summary of the threatened species that were detected during the 2016/17 surveys and the management actions that were recommended to reduce potential impact on these species.

**Table 3: Threatened species detected during the 2016 fauna monitoring program and actions recommended to minimise impacts from timber harvesting activities.**

Coupe Report ID	Threatened species found	Recommended management action (extracted from the survey report)
Big Brook 06 and 09	Forest Red-tailed Black Cockatoos (VU), Western Ringtail Possum (CR), and Quenda (P)	<p>Forest Red-tailed Black Cockatoo – fresh and large quantity of feeding activity was detected in a marri grove adjoining a riparian system in the northern part of the coupe. It is proposed that the marri grove be excluded from harvesting. Map of recommended exclusion area provided in the report.</p> <p>Western Ringtail Possum – old dreys, faecal material and an image on a camera confirm the presence of at least one ringtail possum in the north-eastern part of the coupe. The area is dominated by <i>Allocasuarina decussata</i> in the mid storey, and adjoins a <i>Taxandria juniperina</i> system outside of the coupe, which is likely to be suitable for this species. It is proposed that the grove of <i>Allocasuarina decussata</i> be excluded from harvesting activities, along with a 100 m buffer of forest. This area contains three hollow bearing trees. Two of these have some evidence of use by possums (scratching). The grove also contains a number of potential habitat trees (no current hollows but &gt;500mm diameter at breast height). Map of recommended exclusion area provided in the report.</p> <p>Quenda - All quenda activity was recorded within and adjoining riparian systems, which will be protected in riparian buffers during harvesting.</p>
Brockman 02 and 03	Quenda (P) diggings were located within and adjoining riparian systems in the northern and southern areas of the coupe.	All indirect indicators of quenda activity were located within and adjacent to riparian systems within the coupe. These animals are likely to be protected within the riparian buffers. Postharvest predator baiting (including the proposed Eradicat <sup>®</sup> trials) will also contribute to better protection for quenda and other species using these riparian systems.
Brockman 06 and 07 (First Thinnings)	Quenda (P) were detected adjacent to the edge of the coupe in the north west corner	Low levels of quenda activity were recorded within the north western corner of the coupe. The area being used by quenda is adjoining riparian and mid slope areas to the west that will not be disturbed by harvesting. Post-harvest predator baiting will contribute to improved likelihood of survival for this species in the area.



**Table 3: Continued**

Coupe Report ID	Threatened species found	Recommended management action (extracted from the survey report)
Channybearup 02	Baudin’s Cockatoo (EN), Forest Red-tailed Black Cockatoo (VU), Quokka (VU)	<p>Forest Red-tailed Black Cockatoo - a small amount of fresh feeding activity was found in Karri/ Marri mixed forest in the SE corner of the coupe. This area is within the informal reserve system associated with the road buffer for Channybearup Rd. Quokka - An individual quokka was detected on camera in riparian habitat within the coupe. This species is known to be relatively mobile in the southern forest, with a large home range (70 ha). They are known to feed in disturbed areas, as long as adequate shelter and protection from predators is available (Bain <i>et al.</i> 2016). Protection of the riparian habitat and post-harvest predator baiting will contribute to these requirements. In addition, Channybearup forest block is the control area for the Eradicat® trial. As a part of this trial, feral cat activity levels will be monitored for at least the next 3 years.</p>
Dombakup 07 (First Thinnings)	Quenda (P) and Quokka (VU)	<p>Quokka - low levels of quokka activity (24 images of an adult quokka on a single night) were recorded in the north western corner of the coupe area, immediately upslope of a riparian system. Quokkas are known to be relatively mobile in the southern forest, travelling distances of up to 10 km in a night. They are known to feed in disturbed areas, as long as adequate shelter and protection from predators is available (Bain <i>et al.</i> 2016). Protection of riparian habitat and post-harvest predator baiting will contribute to these requirements.</p> <p>Quenda - low levels of quenda activity (a single image of an adult) were recorded near the eastern boundary of the coupe. The area being used by the quenda is adjoining a riparian system to the east and given the low level of activity on the camera, it is likely that the quenda detected is living in the riparian system and venturing up into the coupe area infrequently to forage. The riparian system will not be disturbed by harvesting. Post-harvest predator baiting will contribute to improved likelihood of survival for this species in the area.</p>
Lewin 05 and 06	Quokkas (VU) were detected throughout the coupe in riparian and ridgeline forest habitat. Up to 6 individuals were detected on the cameras and evidence of quokka activity was detected in most areas that were surveyed	<p>Five of the survey cameras detected quokkas within the coupe area, including at least one female and young at foot, and one male. In total there were images of up to 6 individual quokkas. Quokkas are known to be relatively mobile in the southern forest, travelling distances of up to 10 km in a night. They are known to feed in disturbed areas, as long as adequate shelter and protection from predators is available (Bain <i>et al.</i> 2016). Protection of riparian habitat and post-harvest predator baiting will contribute to these requirements.</p>



**Table 3: Continued**

Coupe Report ID	Threatened species found	Recommended management action (extracted from the survey report)
Mattaband 08, 09, 11 and Wattle 11 (First Thinnings)	Quokka (VU) were detected throughout riparian, mid slope and ridgeline habitats; Quenda (P5) were detected within riparian habitat	<p>Quokka – 70 % of the survey cameras detected quokkas. There appear to be at least three individuals contributing to these images; two adults and a juvenile. Quokkas are known to be relatively mobile in the southern forest, travelling distances of up to 10 km in a night. They are known to feed in disturbed areas, as long as adequate shelter and protection from predators is available (Bain <i>et al.</i> 2016). Protection of riparian habitat and post-harvest predator baiting will contribute to these requirements.</p> <p>Quenda - quenda activity was recorded within the riparian system in the north western corner of Mattaband 08. This system will be protected in riparian buffers during harvesting. Post-harvest predator baiting will contribute to improved likelihood of survival for this species in the area.</p>
Mattaband 10 and 11 North (First Thinnings)	Quokka (VU) were detected throughout riparian, mid slope and ridgeline habitats	<p>8 out of 12 of the survey cameras detected quokkas. There appear to be at least two adult quokkas contributing to these images. Quokkas are known to be relatively mobile in the southern forest, travelling distances of up to 10 km in a night. They are known to feed in disturbed areas, as long as adequate shelter and protection from predators is available (Bain <i>et al.</i> 2016). Protection of riparian habitat and post-harvest predator baiting will contribute to these requirements.</p>
Treenbrook 05	Quokka (VU): an individual was detected on camera in a midslope area within pre 1950s regrowth, close to the northern boundary. Quenda (P) diggings were located within and adjoining riparian systems in the western areas of the coupe. Forest Red-tailed Black Cockatoos (VU) were detected outside of the coupe area.	<p>Quokka - An individual quokka was detected on camera in midslope habitat approximately 150 m from the nearest riparian system and 112 m from the coupe boundary. This species is known to be relatively mobile in the southern forest, with a large home range (70 ha). They are known to feed in disturbed areas, as long as adequate shelter and protection from predators is available (Bain <i>et al.</i> 2016). Protection of riparian habitat and post-harvest predator baiting (including the proposed Eradicat<sup>®</sup> trials) will contribute to these requirements.</p> <p>Quenda - All indirect indicators of quenda activity were located within and adjacent to riparian systems within the coupe. These animals are likely to be protected within the riparian buffers. Post-harvest predator baiting (including the proposed Eradicat<sup>®</sup> trials) will also contribute to better protection for quenda and other species using these riparian systems.</p>



**Table 3: Continued**

Coupe Report ID	Threatened species found	Recommended management action (extracted from the survey report)
Nelson 02	Forest Red-tailed Black Cockatoo (VU), Quokka (VU) and Quenda (P)	<p>Forest Red-tailed Black Cockatoo – Feeding activity was detected south of Stallard Rd, extending south towards a riparian system in the core of the coupe (see Figure 7). Two adults (male and female) were heard calling and were sighted within this area in December 2016. Two adults (male and female) and a juvenile were heard calling and were sighted within this area in February 2017. Multiple trees containing hollows were recorded within this area. None of the hollows had any evidence of recent use by cockatoos. The riparian system downslope contained a number of large trees with hollow-bearing potential as well as suitable roost sites. A recently used cockatoo hollow was found east of Willow Formation Rd in December 2016. The hollow had been chewed around the entrance in a manner consistent with cockatoo nesting behaviour. It is proposed that an area of forest south of Stallard Rd be excluded from harvesting to protect elements of cockatoo habitat described above. Part of this area is already protected by informal reserves. The proposed exclusion will connect the two existing informal reserves. The recently used cockatoo hollow occurs within an informal reserve. The tree and surrounding habitat will be protected within this reserve. See Appendix 5 and Figure 7 for full details.</p> <p>Quokka - Two of the survey cameras detected a quokka within the coupe area. The animal captured by these cameras appears to be the same individual. Quokkas are known to be relatively mobile in the southern forest, travelling distances of up to 10 km in a night. They are known to feed in disturbed areas, as long as adequate shelter and protection from predators is available (Bain <i>et al.</i> 2016). Protection of riparian habitat and post-harvest predator baiting will contribute to these requirements.</p> <p>Quenda - quenda activity was recorded within the western-most riparian system. This system will be protected in riparian buffers during harvesting. Post-harvest predator baiting will contribute to improved likelihood of survival for this species in the area.</p>