



Forest Products Commission (FPC) - Fauna monitoring program in the Karri forest – March 2016

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 March 2016
Objective 1: To determine the presence of threatened or priority listed species within a selection of karri forest areas planned for timber harvesting;	Develop and 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.	The fauna monitoring program was developed based on survey techniques that maximise detection probability. Development of the program included the preparation of standard monitoring procedures and a training manual. The program was implemented in early 2016 (January-March) 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 11 of the 21 coupes surveyed. Management actions were recommended for each of these coupes and include protection of riparian habitat, post-harvest predator and feral pig control, retention of mature marri trees to provide an ongoing food source for cockatoos, modification of harvest timing to avoid periods when <i>Phascogale</i> young are likely to be in nests (July-Sept) and retention of visible hollows (See Table 3 for full details).



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Table 1: Continued

Objective	Target	Performance Measure	Progress as at March 2016
Objective 3: To improve the functionality of the Fauna Distribution Information System;	Develop and implement a process for using fauna survey outcomes to improve or validate FDIS, in consultation with Parks and Wildlife	Process established and implemented prior to the end of 2016.	Consultation with Parks and Wildlife identified that provision of fauna capture data as a geo-referenced spreadsheet would allow upload of this data into threatened species data sets, which are used to validate FDIS. All capture records were provided in the required format to Species and Communities Branch at the completion of the fauna survey program.
	Establish procedures for delivering training and assessing competencies.	Training manual completed, including procedures for delivering training and assessing competencies.	A training manual was completed in December 2015, which establishes clear processes for delivery of training and assessment of competencies.
	Maintain a record of skills, experience and competency levels of trained personnel.	Record system established for training and competencies, consistent with FPC requirements.	A record of competencies has been completed for all trainees involved in the 2016 fauna monitoring program.
Objective 4: To build and maintain internal knowledge and skills relevant to fauna monitoring and biodiversity management within proposed harvest areas.	Actively address personnel skill and experience shortfalls through targeted training.	Deliver at least one training session in 2015/ 2016 prior to implementation of fauna monitoring program.	An office based training session was delivered in December 2015. In addition, multiple field training sessions have been delivered 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 Carpet Python has been removed from the list since the commencement of the survey. In addition, <i>Moggridgea tingle</i> has had a name change to <i>Bertmainius tingle</i> (Harvey <i>et al.</i> 2016). An external ecologist has also been employed to help meet this objective.
Objective 5: To ensure approaches to monitoring remain contemporary, relevant and credible.			

Table 1: Continued

Objective	Target	Performance Measure	Progress as at March 2016
Objective 5: To ensure approaches to monitoring remain contemporary, relevant and credible.	Evaluation of effectiveness of training	Implement field evaluation of consistency in habitat tree retention, camera trap establishment, indirect fauna monitoring techniques and call surveys.	An external ecologist was employed to deliver fauna monitoring training. Three trainees were evaluated in the field and competency assessments completed. All three were found to be competent in identification of trees requiring retention, camera trap establishment, indirect fauna monitoring techniques and call surveys. All three were found to require further exposure to refine their skills and improve their expertise in these areas. This was particularly the case for the indirect surveys and call surveys, where exposure to different species, their activity indicators and calls will improve interpretation of these variable parameters in the field.

Table 2 presents a summary of the threatened fauna species that were considered most likely to occur in the karri forest for the 2016 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. As mentioned in Table 1, there have been some minor changes to the list since implementation of the survey, and this will be adjusted prior to next year’s survey. For example, the Carpet Python is no longer a listed species, and *Moggridgea* has had a genus change to *Bertmainius*. Also, the Numbat was previously listed as Vulnerable, but it is now Endangered.

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 tapoatafa</i>)	VU	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.



Photo: Parks and Wildlife W Shield

Table 2: continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Mammals continued</i>			
Chuditch (<i>Dasyurus geoffroi</i>)  Photo: D. Tapley Walpole	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.
Numbat (<i>Myrmecobius fasciatus</i>) 	EN	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 <i>et al.</i> 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.

Table 2: continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Mammals continued</i>			
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.
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.

Table 2: continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
Birds			
Western Ringtail Possum <i>(Pseudocheirus occidentalis)</i>  Photo: K. Bain Busselton	EN	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.
Woylie <i>(Bettongia penicillata ogilbyi)</i> 	CR	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.	Camera survey and indirect surveys for faecal material and diggings.
Barking Owl <i>(Ninox connivens)</i>  Photo: K. Bain Walpole	P2	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).	Call surveys and search for tree hollows.

Table 2: continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
<i>Birds continued</i>			
Baudin's Cockatoo <i>(Calyptorhynchus baudinii)</i> 	EN	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).	Call surveys and search for tree hollows.
Photo: Johnstone and Kirkby 2015			
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'Ombra 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			

Table 2: continued

Species	Cons Status	Ecological attributes of relevance to monitoring	Monitoring strategies
Invertebrates			
Tingle Spider (<i>Moggridgea tingle</i>)  Photo: K. Bain	EN	The Tingle 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. <i>Moggridgea</i> is currently undergoing a taxonomic revision and will be renamed to <i>Bertmainius</i> , 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
Reptiles			
Carpet Python (<i>Morelia spilota imbricata</i>)  Photo E. Seaman Stirling Range	S	The southwest Carpet Python is found in a variety of moist habitats including Banksia woodland, eucalypt forests and woodlands, riparian systems and granite outcrops. In warm months, the Carpet Python is active either at night, or at dawn and dusk. In cooler months it may be active during the day and has been observed basking. It is an arboreal, terrestrial, and rock-dwelling species and it shelters in burrows made by other animals, hollow tree limbs, or rock crevices (Pearson <i>et al.</i> 2005).	Camera survey in warm weather and suitable habitat



Table 3 provides a summary of the threatened species that were detected during the 2016 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
Channybearup 01	4 individual quokkas were identified in pre 1950s ridgeline and mature riparian habitat. Old quenda diggings were found within riparian habitat, but no fresh activity was found for this species.	Quokkas have a large home range (70ha) and are capable of moving significant distances (Bain 2015). 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. There is also a high level of feral pig activity within this coupe. Post-harvest control may be needed to reduce impacts of feral pigs on soil integrity and forest structure.
Court 04	No threatened species were identified during surveys. There were, however, quokkas detected in Channybearup01 to the east. It is likely that these animals are also using habitat within Court04.	There is a high level of feral pig activity within this coupe. Post-harvest control may be required to reduce impacts of feral pigs on soil integrity and forest structure as the area is regenerating.
Crowea 12	Quenda were detected within and adjacent to riparian systems within Crowea12. Old quokka activity was found during the indirect surveys however, all faecal material found was well over 12 months old and no quokkas were captured on the cameras.	Quenda were located within and adjacent to riparian systems within the coupe. These animals are likely to be protected within the riparian buffers. Post-harvest fox baiting could contribute to better protection for quenda using these riparian systems and could improve the suitability of regenerating habitat for other ground dwelling species of threatened fauna that have previously used the area, such as the quokka.
Diamond One 12, 17, 18, 19, 20	There was a small amount of recent feeding debris detected on the southern boundary of the coupe that was consistent with Red-tailed Black Cockatoo feeding patterns. Nuts from a single Marri tree had been chewed on and it seemed to be a single feeding event involving a low abundance of cockatoos. Birds were detected roosting to the east of the coupe in the riparian system, but there were no nests or roosting areas detected within the coupes.	While a small amount of Red-tailed Black Cockatoo feeding activity was detected on a single Marri tree within the coupe, it is highly unlikely that this is a quality feeding site, given the relatively low availability of mature marri trees in the area. However, care will be taken during habitat tree marking to retain mature marri trees that may provide an ongoing food source for this species.



Table 3: Continued

Coupe Report ID	Threatened species found	Recommended management action
Dordagup 05	Brush-tailed Phascogale tails were located on the road adjacent to the coupe. Both tails were from juveniles and it is likely that these animals were predated as they were foraging outside of the nest. Both were too small to have left the nest completely	Positive indicators of Brush-tailed Phascogale were located proximate to the coupe. Despite intensive searches for suitable hollows within the karri, including two arboreal camera sets, none were located. It is likely that hollows for this species are located in the surrounding mature Jarrah/ Marri forest, where hollows were more readily available. Phascogales use multiple hollows within their home range. Care will be taken not to harvest this area when young are likely to be in nests (July-Sept), and visible hollows will be retained during the tree marking processes.
Easter 03	Forest Red-tailed Black Cockatoos were identified using Jarrah forest near the coupe area, but not within the Karri forest areas	No threatened species were observed within the coupe area, nor was there any evidence that threatened species have been using the area. No action required.
Easter 04	Quenda were occupying a creek system in the western part of the coupe.	Quenda is the only species currently using habitat within the coupe and animals were located only within the riparian systems, which will be protected in the riparian buffers. No further action required.
Gordon 2,3,4	2 individual quenda and 2 individual quokkas were identified within the survey area. Habitats occupied in all cases were riparian or adjacent to riparian	Quokka and quenda were located within these coupes, but in all cases were associated with riparian habitat. This habitat will be protected within the riparian buffers.
Lewin 03	Old Forest Red-tailed Black Cockatoo feeding debris and old, inactive quokka runnels were detected during the indirect surveys. All evidence was > 12 months old located on the Jarrah/ Karri ecotone, at the edges of the karri cell.	No threatened species were found to be currently using this area. No action required.



Table 3: Continued

Coupe Report ID	Threatened species found	Recommended management action
Lewin 08, Graphite 02, Graphite 04	363 images of the 562 images captured by the cameras were of quokkas. Individual recognition of quokkas suggests that at least 6 and as many as 11 individuals are currently occupying the surveyed area. Habitats occupied included mature and first thinning forest, across all topographical gradients (within riparian, adjacent to riparian, midslope and ridgeline).	Quokkas are capable of moving significant distances in the southern forest (up to 10 km per night). All three of these coupes are relatively small, linear and proximate to a coarse mosaic of undisturbed riparian systems, mature forest and previously harvested forest. Suitable habitat is available surrounding the coupe areas and riparian vegetation will be retained as ongoing refuge from predators and as a means of maintaining safe connectivity between areas of habitat. There is a high level of feral predator activity within this coupe (foxes and cats). Post-harvest fox and cat control programs could further reduce predation risks for fauna taking refuge in habitats surrounding the coupe and for animals recolonising or foraging in the coupes.
Northcliffe 03	Quenda were detected within and adjacent to riparian systems and one animal was detected midslope in first thinning karri. Old quokka activity was found during the indirect surveys however, all faecal material found was well over 12 months old and no quokkas were captured on the cameras.	Quenda were located mostly within and adjacent to riparian systems within the coupe. The one midslope detection was in first thinning karri, which won't be disturbed by harvesting activities proposed for this coupe. These animals are likely to be protected within the riparian buffers and uncut areas. Post-harvest fox baiting could contribute to better protection for quenda using this refuge habitat and could improve the suitability of regenerating habitat for other ground dwelling species of fauna.
Treenbrook 1 and 6	Quenda were detected within the riparian system adjacent to Treenbrook 1. Old quokka activity was found during the indirect surveys however, all faecal material found was well over 12 months old and there was no evidence of fresh activity.	Quenda were located in the riparian systems adjoining the coupes, but not within the coupes themselves. There was a high level of fox activity within and surrounding the coupes. Post-harvest fox baiting could contribute to better protection for quenda using the riparian systems and could improve the suitability of regenerating habitat for other ground dwelling species of threatened fauna, such as the quokka.