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Keane Road Strategic Link (KRSL)
Assessment of the status of the Western Grey Kangaroo and Brush
Wallaby in Bush Forever Site No. 342

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BACKGROUND

Public submissions on the Keane Road Strategic Link (KRSL) Public Environmental Review (PER) included concerns about the potential impact of the proposed road upon large mammals (primarily the Western Grey Kangaroo but also the Brush Wallaby). The main concern was that the road could isolate small populations and potentially lead to local extinction, thereby resulting in a loss of biodiversity within Bush Forever site 342, through which the KRSL passes.

The City of Armadale has proposed the installation of seven wildlife underpasses to address these concerns (one 1200 x 1200mm, two 600 x 1200mm and four 450 x 1200mm), and approached Bamford Consulting Ecologists (BCE) to conduct an assessment of the status of the two species in the site. This was considered relevant to the KRSL PER as while the Grey Kangaroo is known to be present, it is not known how many and where the species occurs. In addition, while the Brush Wallaby had not previously been confirmed on site it was thought to possibly be present (Turpin and Bamford 2013).

METHODS

There are several methods available for estimating the abundance of large macropods (kangaroos and wallabies). BCE has used direct counts in the evening where animals are emerging from cover to feed on lawn areas, but this is only effective where there are large areas of lawn and small areas of bushland, such as on golf courses. Bush Forever site 342 consists mostly of native vegetation, much of it very dense, with paddocks on adjacent farms and small areas of grassy weeds in scattered disturbed parts of the site. Grazing macropods are thus likely to be scattered and difficult to observe.

Bamford and Bamford (1999) used a 'human-chain' survey approach to survey for Brush Wallabies in Whiteman Park, and found that this cryptic species was readily detected and that consistent density estimates could be calculated. Western Grey Kangaroos were also found. Therefore, a human-chain approach was used to survey for macropods in Bush Forever site 342. This approach involved a team of six people walking side-by-side but about 20m apart, so that a transect of about 100m width was surveyed. The people on each end carried GPS units in order to keep the overall transect straight. Five such transects were surveyed across the Bush Forever site (see Figure 1), with a total length of 6km. The width did vary slightly, especially in areas of dense vegetation where it was not possible to walk in a straight line, and the total area searched was approximately 62ha. Thus, with the Bush Forever Site 342 area of 368.6 ha, 17% of the site was surveyed.

The human-chain search was probably not complete along the transects for either species, as some individuals of both may move quietly away and not be detected; this was found especially with the Brush Wallaby where additional observers noted one additional wallaby for every four observed by people in the human-chain (Bamford and Bamford 1999). Brush Wallabies at Whiteman Park also sometimes did not flush until distances as little as 2m (more usually 5-10m), and therefore at a spacing of 20m at least some Brush Wallabies may have been missed. Despite this, the human-chain approach provides a minimum density estimate and an opportunity to confirm the presence of both species.

Arnold *et al.* (1992), working in the WA Wheatbelt, developed a survey technique based upon counting the scats (droppings) of kangaroos and relating this to the abundance of animals, but there is uncertainty regarding the relationship between kangaroo and scat density in different environments. It was therefore considered that conducting exhaustive scat counts in Bush Forever site 342 might not yield reliable data, but notes were made on the presence of scats. In addition, estimates of the number of scats in quadrats 1m wide by 100m long were made, with one scat-count quadrat on each of transects 1, 2 and 5, and two quadrats on each of transects 3 and 4. The quadrats had an approximate area of 100m². Arnold *et al.* (1992) calculated that a scat density of 10,000 scats/ha was equivalent to a density of 0.1 kangaroos/ha, and this relationship was used to estimate the kangaroo population size.

Other evidence of kangaroos was recorded when observed. This included trails (where regular movement of animals creates a distinct trail through vegetation), bones and other remains.

The field survey was undertaken on 26th March 2014 by Mike Bamford, Peter Smith, Sarah Smith, Natalia Huang (Bamford Consulting Ecologists) and James Robinson and Karen Colli (City of Armadale). The work was undertaken under Regulation 17 licence number SF009737 issued by the Department of Parks and Wildlife.

RESULTS

A single Grey Kangaroo (female with pouch young) and a single Brush Wallaby were observed, with both these records in banksia woodland in the east of Bush Forever site 342 (Table 1 and Figure 1). There was also one recent (dead for 2-3 days) road-killed Grey Kangaroo on Anstey Road, and skeletal remains were found at two locations. Grey Kangaroo scats were found throughout the site, as were kangaroo trails (Table 1 and Figure 1). Some of the kangaroo trails were leading out of the Bush Forever site towards adjacent farmland, suggesting that the animals move in and out of the site regularly, but foraging signs of kangaroos were found on Kikuyu grass in cleared areas within the site. Scats were slightly concentrated round these disturbed areas including wetland areas invaded by exotic grasses, and there were very low densities of scats in dense thickets, although visibility in such thickets was limited.

DISCUSSION

Population Estimates

The small number of both species observed suggests small populations. If it is assumed that all animals within the transect search area (62ha) were recorded, then this suggests populations of just five of each species. Even accepting that some animals either moved away or did not move and were thus not detected, populations are still likely to be low; perhaps in the order of 10-20 animals of each species, or perhaps a slightly larger population of Western Grey Kangaroo (15 – 30 animals) given habitat and foraging area available in surrounding farmland. In comparison, Bamford and Bamford (1999) estimated there were 160 Brush Wallabies in the 1000 ha conservation area of Whiteman Park.

The estimated densities of kangaroo scats (Table 2) suggest a similar population size as proposed above. The number of scats in each transect of 100m² ranged from 20 to 60, with a mean of 35.7. This equates to a density of scats of 3570/ha which, using the relationship calculated by Arnold *et al.* (1992), gives a kangaroo density of 0.0357/ha and a population across 300ha of 11 animals. This is low compared with Grey Kangaroo populations in many bushland areas around Perth, but the Bush Forever site 342 has only small areas of exotic grass to provide grazing.

Management Priorities

Populations of both the Grey Kangaroo and Brush Wallaby will require management in Bush Forever Site 342. Small populations can be vulnerable to local extinction, and with expanding urban development the risk of dog attack is likely to be high. In one golf course Kangaroo population, the main source of mortality was domestic dogs (Bamford Consulting records). In addition, reports have been received by the City of Armadale from local community that kangaroos have been shot as “game” and hit by off road vehicles within the site (pers. comm. James Robinson).

Conversely, small populations in restricted areas can experience over-population if predators are effectively excluded. In-breeding is also a risk. Mills and Allendorf (1996) suggest that inbreeding can be counteracted by a small number of immigrants per generation, but this is a complex topic and depends on factors such as population size.

Therefore the populations of Grey Kangaroo and/or Brush Wallaby within Bush Forever Site 342 will require management by the responsible authority for the site Department of Parks and Wildlife (DPaW) to ensure the population is viable in the long term and manage issues such as:

- Off road vehicle access to the site
- Shooting
- Inbreeding
- Dog attack
- Possible over population and grazing pressure leading to degradation of native vegetation within the Bush Forever site.

These management issues will exist within Bush Forever Site 342 regardless of whether KRS� is approved and constructed or not. Therefore, management of these issues is a separate matter which would need to be addressed by the authority responsible for the site (DPaW), regardless of whether or not the KRS� is constructed.

The key management issues for the KRS� road alignment regarding kangaroo and wallaby are to ensure that the road if constructed does not lead to local extinction, thereby resulting in a loss of biodiversity within Bush Forever site 342 through which the KRS� passes. This requires the management of the following issues by the City of Armadale:

- Preventing the road causing genetic and habitat based isolation of small populations; and
- Preventing road kill.

Other Fauna Observations

Some other fauna observations were made and are noted in Table 3. Evidence of the Quenda (bandicoot) was found throughout, and both Carnaby's and Forest Red-tailed Black-Cockatoos were present. Also of interest was the Grey Shrike-thrush and Red-capped Robin, both being species rarely observed in urban bushland around Perth.

CONCLUSIONS

The survey confirmed the presence of Grey Kangaroos and Brush Wallabies in small numbers. The Brush Wallaby population is very small, perhaps 10-20 animals, while the Grey Kangaroo population may be slightly larger (perhaps 15 – 30 animals) and is almost certainly shared with surrounding farmland. Such small populations are likely to be vulnerable to isolation with or without the KRS�, and will almost certainly require management if they are to persist within the Bush Forever Site 342. Road-kill is clearly an existing issue for Western Grey Kangaroos, especially if they are moving regularly from the

bushland to nearby paddocks to forage. The presence of skeletal remains of two animals in bushland away from roads may have been the result of natural mortality, but there is the possibility of dog attacks and illegal shooting.

To be conserved, such small and isolated or partly-isolated populations will require some on-going management irrespective of the KRS�. Therefore populations of the Grey Kangaroo and Brush Wallaby within Bush Forever Site 342 will require management by the responsible authority for the site (DPaW) to ensure they are viable in the long term. Issues to be managed are:

- Off road vehicle access to the site
- Shooting
- Inbreeding
- Dog attack
- Possible over-population and grazing pressure leading to degradation of native vegetation within the Bush Forever site.

The key management issues for the KRS� road alignment regarding kangaroo and wallaby are to ensure that the road if constructed does not lead to local extinction, thereby resulting in a loss of biodiversity within Bush Forever site 342 through which the KRS� passes. This requires the management of the following issues by the City of Armadale:

- Preventing the road causing genetic and habitat based isolation of small populations primarily through road underpasses; and
- Preventing road kill primarily through appropriate fencing of the road.

The underpasses proposed for the KRS� by the City of Armadale (one 1200 x 1200mm, two 600 x 1200mm and four 450 x 1200mm) should allow for movement of all fauna that might be adversely affected by fragmentation caused by the road itself. This includes Grey Kangaroos that can be expected to readily use the 1200mm high underpass, with some usage by smaller females of the smaller (600mm high) underpasses. The proposed underpasses should thus mitigate the risk that might otherwise be imposed upon fauna populations by the KRS�. Similarly fencing the KRS� road to the specification of DPaW will prevent road kill on this road.

Table 1. Records and other evidence of the Grey Kangaroo and Brush Wallaby from the survey transects (Zone 50, datum WGS84).

Observation	Easting	Northing
Brush Wallaby		
Female Grey Kangaroo with large pouch young	400920	6444612
Grey Kangaroo bones	400448	6444170
Macropod skeleton (either juvenile kangaroo or wallaby)	399610	6443950
Road kill (grey kangaroo on Anstey Rd)	400985	6444028
kangaroo scats	401100	6445635
kangaroo scats	400907	6445287
kangaroo scats	400615	6444900
kangaroo scats	400700	6444770
kangaroo scats	400766	6443917
kangaroo scats	399880	6444767
kangaroo scats	399580	6444200
kangaroo scats	399600	6444000
kangaroo scats	399749	6443912
kangaroo scats	399857	6443836
kangaroo scats	399996	6443913
kangaroo scats (fresh that morning)	400662	6445512
kangaroo scats	401282	6445544
kangaroo scats	400881	6445224
kangaroo scats 6	400804	6444754
kangaroo scats and grazing on kikuyu	400415	6445020
kangaroo scats	400757	6445543
kangaroo scats	399695	6443895
kangaroo scats	400062	6443920
kangaroo trail	400224	6445276
kangaroo trail	401029	6445240
kangaroo trail	400950	6445299
kangaroo trail	400787	6445483
kangaroo trail	400035	6443899

Table 2. Counts of scats in quadrats of approx. 1m by 100m.

Quadrat No.	Transect No.	Estimated number of scats
1	1	30
2	2	40
3	3 (west)	30
4	3 (east)	30
5	4 (west)	40
6	4 (east)	20
7	5	60

Table 3. Other fauna observed during the macropod survey (26/03/14).

Brown Quail. Two birds seen on Transect 5.

Australian Shelduck. Several flushed from a drain.

Common Bronzewing. Few bird. seen in woodland.

Crested Pigeon. Few birds along edges of farmland/woodland.

Wedge-tailed Eagle. Pair over Transect 5.

Red-tailed Black-Cockatoo. Group of three flew over site several times.

Carnaby's Black-Cockatoo. Flock of 15 flew across north of site in late afternoon.

Long-billed Corella. Flock of about 20 birds on eastern edge of site.

Red-capped Parrot. Groups of up to three in woodland occasionally.

Australian Ringneck. Groups of up to three in woodland occasionally.

Elegant Parrot. Two birds seen on Transect 4.

Splendid Fairy-wren. Parties throughout but especially in riparian shrublands.

White-browed Scrubwren. Parties in riparian shrublands.

Yellow-rumped Thornbill. Several parties in open areas including edges of farmland.

Western Spinebill. Few in woodland.

Singing Honeyeater. One seen in woodland.

Western Wattlebird. Few in woodland.

Tawny-crowned Honeyeater. Seen and heard in heathland areas.

Brown Honeyeater. Common in woodland.

New Holland Honeyeater. Common in woodland.

White-cheeked Honeyeater. Few in areas of tall shrubland.

Rufous Whistler. Several calling in woodland.

Grey Shrike-thrush. One herd in woodland in north-east.

Black-faced Woodswallow. Two over Transect 5.

Grey Butcherbird. Heard in woodland.

Australian Magpie. Few along roads and tracks.

Grey Fantail. Several in riparian woodland.

Willie Wagtail. Few along tracks in woodland.

Australian Raven. Pairs seen regularly.

Red-capped Robin. Male seen along western fenceline near Keane Road.

Silvereye. Small flocks throughout.

Tree Martin. Few overhead in paddocks.

Quenda (Southern Brown Bandicoot). Diggings and tracks throughout in all vegetation types. Dead specimen found.

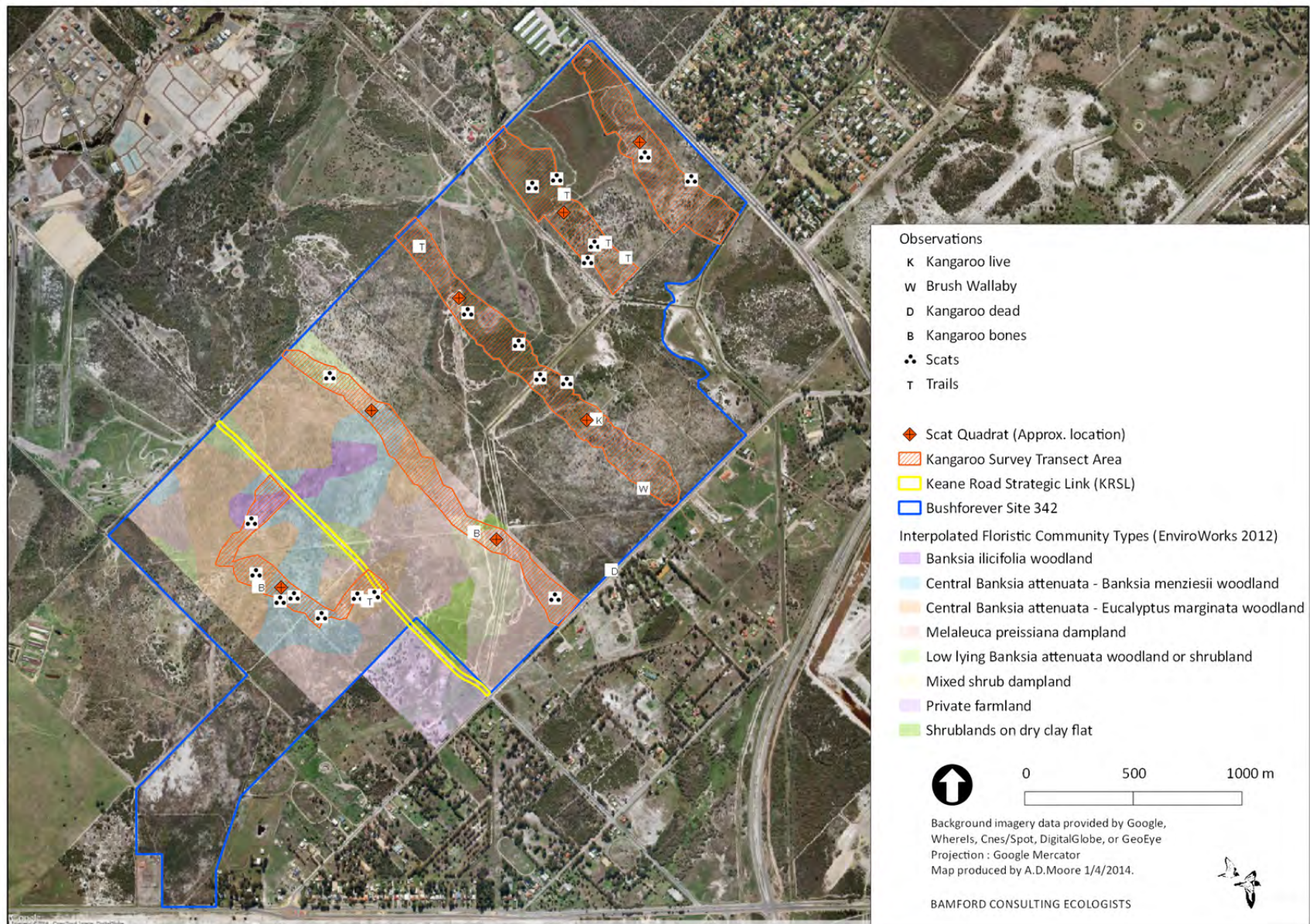


Figure 1. Survey transects in Bush Forever site 342 and location of Kangaroo and Brush Wallaby observation records

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