Project and knowledge gaps that restrict biodiversity conservation in the ANRMR

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To all thanks again,

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Summary

The Avon Catchment Council (ACC) has made a substantial investment into natural diversity conservation. Part of this investment was to examine any gaps in knowledge and/or current natural diversity programs that restrict the ACC from achieving its natural diversity goals. This document collates these identified gaps.

This collation of work was done by the Baselining project, part of the ACC's natural diversity program. Baselining has a data collation and interpretation role including the identification and resolution of gaps. The gaps identified here have come from reviews of natural diversity programs, reviews of approaches to species level conservation and conversations with field staff and their managers. Many of the gaps have been previously identified and are currently being resolved through Baselining's 08/09 program.

The gaps identified fall into two general groups:

(i) Foundational gaps, these are typically higher-order gaps in knowledge that are required to inform the development, management and evaluation of projects within the ACC natural diversity projects. Many of these have been previously identified and are being resolved as part of Baselining's current activities.

(ii) Species level gaps. The ACC natural diversity program has addressed many of the species level gaps and our intent here is not to review the success of these projects but to identify those species that are not part of a strategic program. Often these are not Threatened but are considered Priority species or they are species that are known to be in decline but are not on Western Australia's Threatened or Priority lists. Not all of these gaps can be easily filled: some species have taxonomic issues, others are hard-to-identify wetland invertebrates that require their conservation status and range to be resolved. Here we try to summarise these taxa and identify required actions.

1. Introduction

The Baselining Project (hereafter called Baselining) is one of the Avon Catchment Council's (ACC) natural diversity projects. Its primary purpose is to collate the biodiversity data of the Avon Natural Resource Management Region (ANRMR) and interpret these data to support other projects in the ACC's natural diversity theme. One of the other identified roles of Baselining is to identify key knowledge and operational gaps in natural diversity conservation within the region. Some progress has already been made towards this goal. In June 2007, a preliminary gap analysis and proposed work schedule for the 07/08 was presented to the ACC. Since then a draft Biodiversity Assessment of the ANRMR (Richardson *et al.*, 2007,) which reviewed the biodiversity assets and existing conservation related projects, has been released. That document also identified a number of gaps. This document reviews the progress towards filling those previously identified gaps and identifies further gaps in knowledge and existing programs.

2. Foundational Gaps

Foundational gaps, these are typically higher-order gaps in knowledge that are required to inform the development, management and evaluation of projects within the ACC natural diversity projects. Many of these have been previously identified and are being resolved as part of Baselining's current activities.

2.1 Collating Existing Vegetation Mapping

Collating all the existing vegetation mapping across the region was identified as a priority gap in 2007. It was argued then that due to GIS technology we know where the patches of remnant vegetation are but we have little knowledge of what vegetation communities are contained in those patches. The information collected from this project will support the project defining vegetation communities and condition indices (see Section 2.2) and defining Threatened Ecological Communities (see Section 2.4).

This is a mature, almost completed project that aimed to collate and present all the existing regional vegetation maps into a single GIS layer with a linked dB that retains vegetation information. A seminar and workshop was held to in May 2008 to release the application and get feedback on this early version. A report has been written about the seminar and workshop (Richardson *et al.*, 2008). Feedback from this workshop has been included into later versions of the application.

In summary we now have the available vegetation maps of the ANRMR available on a single GIS platform that is linked to an Access dB with query functions. The vegetation maps in this GIS application extend over 8% of the remnant vegetation of the agricultural district of the Avon NRM Region; approximately 185,000 hectares.

2.2 Benchmarking Vegetation Communities and Developing Condition Indices

Knowledge of vegetation condition is critical for many of the Avon's natural diversity projects; vegetation condition is required to identify management actions, prioritise on-ground work and as a tool to evaluate success of project outputs. This gap was identified in 2007 and we recently appointed a research scientist to develop the concept.

The March status report is attached as Appendix 1.

2.3 The Need for Integration between Projects

The review of the biodiversity values and existing and historic conservation projects (*The Biodiversity of the Avon NRM Region: Towards Prioritisation for Conservation;* Richardson *et al.*, 2007) identified the need to integrate the biodiversity projects in the region. It

argued that each project was working at its own level within the biodiversity hierarchy and that there was scope to integrate the projects if a single prioritisation process was used.

This project is currently underway with a contractual/collaborative arrangement with James Cook University. At present the data has been prepared, a suite of expert panel processes have been completed and we are now developing targets and thresholds. The output from this process will inform the ACC's National Reserve System focus in CfoC.

2.4 Describing Threatened Ecological Communities of the Region

The launch of the CfoC 2009/2010 Business Plan has exposed a challenge for natural diversity conservation in the region: the business plan's focus is clearly on federal government priorities which are those community level assets listed under the 1999 EPBC Act ie those assets that are considered threatened. The ANRMR has numerous vegetation communities that are undoubtedly threatened but, due to the limited knowledge of the vegetation communities and their extent, none of these are listed TEC (the only listed TEC in the ANRMR are: Lake Bryde, Lake Toolibin and part of Bremer Range).

The gap here is acknowledgement of the status of the communities under risk. WWF-Australia has taken the lead on getting this communities identified through the EPBC Act. Baselining will play a supporting role using the output from the *Defining Vegetation Communitie*s above. These results will form a framework to resolve critical questions of previous and current distributions of some communities.

2.5 Prioritising for Future Vegetation Mapping/Assessment/NRS Program

Vegetation communities are a key aspect of the ANRMR natural diversity. At present there are no programs to identify, map or manage high priority vegetation types outside the conservation estate (notwithstanding the *Collating Existing Vegetation Mapping Project* from within Baselining, see above). We believe that this is a critical knowledge gap in that this information will be required for defining TEC across the region. A small project was developed to identify patches of remnant vegetation that are within high priority areas that are readily accessible (ie generally not on private property). Here, we outline the process and results of this work.

An earlier Baselining project identified the high priority vegetation associations within the ANRMR using Beard's Vegetation Associations (BVA); this project was developed to identify priority areas within the region for the *Healthy Ecosystems Project* being delivered by WWF-Australia; see Richardson (2008) for details. An expert panel was convened to review the status of the vegetation associations of the region. To aid their deliberations, descriptions, summary statistics (percent remaining, percent in conservation estate) and location (ie eastern/western wheatbelt) of the vegetation associations was presented to the panel. Forty-one vegetation associations were identified as high priority.

This project aimed to identify which patches of these high priority vegetation associations are readily accessible (ie not on private property) initially this was intended to be used as a way to identify which of these we can access to map, but this may also be useful to consider in context of the National Reserve System.

Here we report on the process and output. Of the 41 BVA that were identified as high priority we focused on those with a landscape position of granite and sand, these were identified as the highest priority. For remnants within these BVA we identified those areas that are unmapped, on accessible tenure (ie not private property) and larger than 1 hectare. Five BHVA were exclusively found on private land (7, 392, 1025, 1059, 1080 – these will not be considered).

Thirty-six BHVA were considered high priority for mapping consisting of 151 sites. Within these the following priorities have been assigned:

- High Priority (9 sites) - contain TECS/PECS and/or are inland BVA # 949 on sand, as described by the expert panel workshop as of particular interest.
- Low Priority (55 sites) - are (i) western BVAs # 949 on Sand as described by the expert panel workshop as of less interest (ii) sites that are largely cleared as determined by examining aerial photographs (iii) are very small and adjacent to much larger areas of the same BVA already mapped (iv) reserves that appear to be GIS artefacts and (v) a small number are of suitable tenure for mapping but access to this land is limited by being surrounded by private tenure.
- A further 87 sites need more work to assign their priority as high, medium or low by ground truthing or by expert review.

These have been collated onto an available dB.

3. Species Level Gaps

Species level gaps were determined by identifying species of concern and programs to recover these species. We determined species of concern from those species listed as Rare and Priority as well as from the literature and from the output of the expert panel workshops convened as part the conservation planning process (see Section 2.3).

3.1 Rare, Priority and Flora-of-Concern

Developing a complete conservation plan requires that the status and location of assets is well known. This concept guided the planning behind a number of small projects each aimed at improving our knowledge of flora assets.

3.1.1 Prioritising Rare Flora Monitoring

One of the earlier outputs from Baselining was a matrix for all populations of Threatened and Priority plant taxa, their monitoring history and recovery plan status. From early analysis it was realised that a major gap was the lack of review of current conservation activities and prioritisation planning for these taxa. This matrix amalgamated the information required to prioritise the flora monitoring program such as time of last assessment for each population, whether or not the taxa has a recovery plan, an interim recovery plan or a plan in process.

3.1.2 Resolving Conservation Status of Plant and Allied Taxa

In other parts of the south-west of WA it has been shown that many taxa currently listed as Priority are actually Declared Rare Flora (DRF). Baselining has been looking for a suitable person to put on contract to go through the Priority flora list and, with some field work and consultations with relevant experts aim to resolve the conservation status of some of the Priority flora. At this stage a suitable person has not been found.

To augment this work we have done an analysis on the combined Banksia Atlas and WA Herbarium data identifying those taxa that are poorly collected (have ≤ 3 vouchers of medium spatial precision) and/or are known from a range of have a range of ≤ 10 kilometres; 286 taxa fulfilled these criteria of which 125 are currently not considered DRF or Priority taxa. These results are to be taken to, in the first instance, DEC's botanists; if required these will also be added to-at least- DEC's Priority taxa list.

3.1.3 Priority Flora Data Entry

The reservoir of monitoring history, threats and land tenure and purpose is contained in DEC's Threatened and Priority Flora dB. While Threatened Flora field data are updated regularly those taxa on the Priority list are less often updated. This has implications in determining which taxa need their conservation status reviewed (see 3.1.2 above).

We are going someway to resolve this by funding a database person to enter ANRMR Priority flora taxa; these will start with ANRMR endemics and those taxa that are poorly collected and/or narrow range. This will get underway in January 09, they will be originally focusing those plant taxa identified in Section 3.1.2.

3.2 Fauna

A full list of the fauna of the Avon NRM/NAP Region is found within Richardson *et al*. (2007)[1] Appendix 5; a review of the status of Threatened and Priority fauna of the region is found in Appendix 5.3, here we look at a subset of these fauna ie those that are found in the ANRMR, require but are not receiving any management actions. This list was developed from a number of forums. For those species known to be Threatened and Priority a review of current conservation activities was undertaken. For all other vertebrate species discussions with relevant experts (including the output from the strategic conservation planning workshops) to determine if a particular species is in decline in the region and what activities are required to ameliorate this decline, part of this discussion is to what extent the ANRMR represents the range of the species.

Table 1 is a summary discussion for those regional species considered Threatened or Priority.

3.2.1 Birds

Carnaby's Cockatoo

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) is considered Endangered. This species occurs across the south-west of WA, generally breeds in the wheatbelt and after breeding moves to the wetter coastal areas. There are numerous complexities in managing this species including the seasonal nomadicity of the species. There are numerous existing projects that the need to be integrated into conservation of this species. Two gaps have been identified.

Firstly, there is a lack of strategic and coordinated recovery actions across the species range. One of us (JR) was invited to be on an organising committee for a seminar aimed at identifying existing recovery actions for the species followed by a workshop aimed at developing then prioritising recovery actions for the species. The seminar and workshop were held on the 1st and 2nd of December 2008 respectively. The output from this will feed into a new recovery plan for the species that will give whole-of-range activities and priorities for the species.

Secondly, identifying and protecting critical feeding and breeding habitat are a core issue for the species. Few of these are known from the ANRMR though two of the Carnaby's Important Bird Areas (IBA) identified by Birds Australia (BA) overlaps the ANRMR. Baselining is currently working with BA to help identify which landholders will be approached with the aim of protecting important patches of bush on their property within

[1] Note that this region differs from the Avon NRM Region in that it also is extended to include the National Action Plan for Salinity and Water Quality boundaries.

these IBA. BA has received a $160,000 grant to identify, protect and manage critical feeding habitat within priority areas for the species.

Declining Sedentary Woodland Birds

In the ANRMR there are 31 species of birds that are considered to be declining sedentary woodland birds, these birds are not listed as Threatened and do occur in other regions besides the ANRMR. Declines for these species appear to be due to fragmentation and degradation of habitat. There has been considerable work identifying procedures for habitat reconstruction within the Avon region in the Gabbi Quoi Quoi (Brooker *et al.*, 2001a) and Morbinning sub-catchments (Brooker *et al.*, 2001b) within the ANRMR; though we are not aware of the output from this work being strategically applied across the region.

There is currently no dedicated program to manage these birds. We recommend that natural diversity programs such as revegetation programs take these birds into consideration and that monitoring programs for these species are undertaken. Retaining these species in remnant vegetation is also a vegetation management issue and the principles for managing for these species should be part of vegetation management protocols.

We recommend that known locations of these birds are monitored for further contraction of range.

Other birds

Not all of the Threatened birds recorded from the region should be considered as part of a conservation strategy for the ANRMR. Some (such as the Endangered Western Whipbird (western heath subspecies) are considered locally extinct; some are considered occasional visitors (such as Vulnerable Recherche Cape Barren Goose, the Vulnerable Australasian Bittern, the Vulnerable Forest Red-tailed Black-Cockatoo and the Vulnerable Australian Painted Snipe). The one record of the Critically Endangered Baudin's Black-Cockatoo within the ANRMR is from 1930 though there are records from 2008 within 1 kilometre from the region's boundary. At this stage we assume that the species is not resident by this may need to be reviewed if the species is found within the region.

The Vulnerable Western Rosella (inland subspecies) is poorly known and it is recommended that further survey is undertaken for this species. In contrast the Vulnerable Malleefowl has considerable survey and research work already underway and benefits from DEC's Western Shield baiting program.

There are numerous Priority taxa birds known from the region: Black Bittern, Painted Snipe, Masked Owl (SW ssp), Rufous Fieldwren (western wheatbelt), Shy Heathwren (western ssp), Bush Stonecurlew, Hooded Plover, Western Whipbird (sthn WA subsp), Australian Bustard, Crested Shrike-tit (south-western subsp.), Crested Bellbird (southern), White-browed Babbler (western wheatbelt). The Black Bittern has declined across south-west and is most likely regionally extinct; its decline is thought to be due to declines in water quality. The Painted Snipe is considered an occasional visitor to the region. The others are resident and are not part of known recovery actions but some may benefit from fox control (eg Bush Stonecurlew) and actions that improve the extent and condition of vegetation (eg White-browed Babbler).

There is currently no dedicated program to manage these birds. We recommend that natural diversity programs such as revegetation programs take these birds into consideration and that monitoring programs for these species are undertaken. Retaining these species in remnant vegetation is also a vegetation management issue and the principles for managing for these species should be part of vegetation management protocols.

3.2.2 Mammals

Many mammals whose range did include the ANRMR are now nationally or locally extinct. Many extant Threatened and Priority species benefit from DEC's recovery actions (including fox baiting), others have benefited from ACC investment, and some need further survey to confirm locations, status and range. Table 1 summarises the important results.

3.2.3 Reptiles

Little is known of most of the reptiles of the ANRMR. The expert panel process for the conservation exercise identified that there are few species that are sufficiently known enough to conclude changes in status. The only species examined here are those from DEC's Threatened and Priority list. Two species are of interest: the Vulnerable Western Spiny-tailed Skink which has benefited due to ACC investment and the Priority 3 Lake Cronin Snake.

Lake Cronin Snake

The Lake Cronin Snake (*Paroplocephalus atriceps*) is probably an ANRMR endemic known from <10 specimens and is a P3 species. It is known from Jilbardi NR, in the proximity to Lake Cronin, Peak Eleanora and Maggie Haynes Hills. It is considered 'vulnerable' due to limited distribution (restricted range) surrounded by unsuitable habitat. It has been suggested by Maryan *et al* (2002) that perhaps the low incidence of observation and collection suggests a 'natural scarcity' that is possibly related to specialized habitat or certain habitat/microhabitat requirements.

Threats include a combination of factors; clearance of habitat for agriculture and grazing if the wheatbelt expands and potential disturbance from mining. There may be strip mining for gold in the future, surrounding Lake Cronin Reserve. The core holes if not capped become a grid of 'pitfall traps' (www.deh.gov.au/biodiversity/threatened/action/reptiles/10)

There are currently no known management actions for this species.

The Action Plan for Australian Reptiles (http://www.environment.gov.au/biodiversity/threatened/publications/action/reptiles/index.html) suggests a number of recovery actions including survey of geographic range and research into basic biology and ecology. The species is not actually known to have declined but is listed as Vulnerable due to its narrow range. The significant gap here is that we know little of this species. The known locations for this species is outside the Agricultural zone and actions for this species are possibly not as urgent as many others.

Western Spiny-tailed Skink

The Western Spiny-Tailed Skink (*Egernia stokesii badia*) is known to occur in the northern and north western parts of the ANRMR and is also known from outside the region. Re-survey of sites across the Mid-West indicated historical populations were in decline or extinct and as a result searches for new populations have occurred during 2008 with some success. The skinks reside in family groups in logs and piles of debris including piles of corrugated iron. Habitat clearing, firewood collection and predation from feral species are thought to be contributing to these declines.

The recent search for new populations showed that a concerted effort is likely to find new populations, particularly in areas where salmon gum and gimlet woodlands are present, as these areas often have suitable logs for habitat.

Revegetation and feral control activities are likely to have ongoing benefits to this species in terms of i) providing new habitats for populations into the future, and ii) reducing predation pressures. The lesson from the Mid-West experience is that ongoing monitoring and management is required to identify and ameliorate decline. This is underway through ACC funding delivered by DEC.

3.2.4 Invertebrates

There are several species of invertebrates that require more survey and/or dedicated programs to ensure their ongoing persistence in the region. Knowledge of some of these species is limited requiring further survey across the ANRMR and/or Wheatbelt to resolve range and conservation status.

The Arid Bronze Azure Butterfly

The arid bronze azure butterfly (*Ogyris subterrestris petrina*) has been recently listed as Critically Endangered and it is one of only two ANRMR animal endemics. Currently the species is only known from a single population at Barbalin Nature Reserve. The species was known from a population near Kalgoorlie which quickly went extinct for unknown reasons (Williams and Williams, 2008).

In review of the status and conservation activity for this species there was found to be a need to resurvey the only population before the end of the survey period (November). A team led by Andy Williams was organised to resurvey the population and to start looking for new populations. A report of this work has been written (Williams *et al.*, 2008) which also identifies gaps in knowledge and programs such as:

(i) a monitoring prescription for the butterfly;
(ii) an identified need to establish a baseline for habitat;
(iii) a need to search for new populations;
(iv) outlines current and future community engagement;
(v) the need for a recovery team.

Baselining is supporting these activities in 2009. The recovery team will be convened by April. The recovery team will lead recovery actions and will have Mukinbudin community membership. By April a baseline of the extent and location of the *Camponotus terebrans* (the ant that the butterfly has an obligate relationship with) nests will be completed. This baseline will be sued to monitor changes of the ant population.

Bothriembryon Snails

Within the ANRMR *Bothriembryon bradshawi* and *Bothriembryon praecelsus* are listed as P1 and presumed extinct respectively. There are two critical gaps with this genus (at least as it pertains to the ANRMR): firstly, there are issues of taxonomy of species secondly species of this genus are only known from a few small populations.

Iredale (1939) described many species in the genus using morphometric data only, more recent examination within the genus has identified a need to use genetic techniques to separate species that are externally-ie morphometrically-similar (Hill *et al.*, 1983). There is, however, little genetic material readily available and, due to few known occurrences there is little opportunity of getting genetic material across the range.

We recognise that resolution of the taxonomy of this group is long-term aspiration and also that, in the short-term, we need to use existing taxonomy but see a synergy in the need to identify new occurrences and allow for the accumulation of genetic material. We propose that all field staff are briefed on the need to locate occurrences of land snails in the region and that they at least submit an empty shell with a precise geo-location to the museum, or ideally collect live specimens (field staff can be trained into how to locate) and send with a precise geocode to the WA museum and UWA Department of Zoology c/o Mike Johnson.

Threatened Spiders

The four Threatened spiders of the region (the Critically Endangered Yorkrakine Trapdoor Spider and Minnivale Trapdoor Spider, the Endangered Tree-stem Trapdoor Spider and the Vulnerable Shield-backed Trapdoor Spider) all have existing programs and interim conservation plans in process.

Priority Terrestrial Invertebrates

The Priority 3 bee *Hylaeus globuliferus* is recorded from the ANRMR and elsewhere; mainly the west coast north of Perth. This species needs further survey work to determine more fully its distribution and conservation status.

The Priority 1 Bush Cricket (*Ixalodectes flectocercus*) was thought to be extinct as it had not been collected since 1896 and the original and only location of collection at Beverley has undergone high levels of modification this bush cricket was found to be common at Dog Rock, Kokerbin NR and on a small (<1 acre) patch of remnant vegetation 16km NW of Merredin on the Merredin - Wyalkatchem Rd and on roadside vegetation on the highway NE of Quairading in 1999[2]. It is now listed as a P1 species (taxa with few, poorly known populations on threatened lands) It is thought that as long as the reserves where these specimens were collected do not decline in condition significantly, the population should remain stable (Anon., 1999).

There appears to have been no work done on this species since. There are issues around identification of this species but it is recommended that these are resolved and these sites be resurveyed.

[2] These comments are taken from this species file at DEC's Species and Communities Branch.

Priority Wetland Invertebrates

There are three Priority wetland invertebrates in the region, each are also found outside the ANRMR, none are considered high priority and they would benefit from further survey to determine conservation status.

Branchinella simplex

This Priority 1 species has very little known of its biology and distribution. There are few records, the most recent being a 1997 record from Larke's Dam, Kurrenkutten near Corrigin. Records outside the ANRMR are from near Kalgoorlie (Lake Kofar) and also Meekatharra (Lake Anneer). Although not formally recorded we are also aware of a definite record from a samphire pan near Lake Monger (Adrian Pinder pers comm. 2009). Recommendations made by Tony Friend to the TSSC in 1995 were to conduct research on this species to confirm if halophilic, unlike other members of the genus and define distribution through survey. A 2009 recommendation by Adrian Pinder (pers.comm, 2009) is to survey to determine both geographic extent and field salinity tolerance as a higher priority over laboratory studies of salinity tolerance.

Parartemia contracta

This Priority 1 species also has very little known of its biology and distribution. Main threats are changes in hydrology which reduce acidity and introduction of other species, especially Artemia. Tony Friend recommended to the TSSC in 1995, research to determine the risks of the introduction of Artemia species. A more general survey of wetland biodiversity of the arid zones survey as recommended by Adrian Pinder (pers.comm, 2009) for *Branchinella simplex* would also benefit our understanding of this threatened species.

Daphnia jollyi

Daphnia jollyi is somewhat better known in regard to its biology and distribution than *Parartemia contracta* and *Branchinella simplex* but could still benefit from further survey and perhaps research to define its distribution. Tony Friend noted in 1995 that threats include grazing, eutrophication and fertilizer drift. A more general survey of wetland biodiversity of the arid zones survey as recommended by Adrian Pinder (pers.comm, 2009) for *Branchinella simplex* and *Parartemia contracta* would also benefit our understanding of this threatened species.

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GROUP	Status	Common Name	Scientific Name	Regional Status	Current Actions	Required further Actions
Birds	CR	Baudin's Black-Cockatoo	Calyptorhynchus baudinii	Recent records in southwest of region	Recovery team, limited actions within the region.	Engage with recovery team.
Birds	EN	Western Whipbird (western heath subs	Psophodes nigrogularis nigrogularis	Old record only around Wongan Hills, probably locally extinct		
Birds	EN	Carnaby's Black-Cockatoo	Calyptorhynchus latirostris	Records generally from south and west of region, many records few breeding records, though two IBAs intersect the north-western part of the region	ACC funds a community engagement officer; BA through the Carnaby's Project Advisory Group (PAG) manages two Project Officers active in Northern Wheatbelt and South-Coast; the PAG and Recovery Team recently ran a workshop and seminar around capturing current recovery actions and identifying and prioritising actions required for recovery of the species across its range (the ACC partially funded this work);	More survey for breeding and feeding locations and integration with the recovery team
Birds	VU	Recherche Cape Barren Goose	Cereopsis novaehollandiae grisea	A single old record, not considered a regular visitor to the region		
Birds	VU	Australasian Bittern	Botaurus poiciloptilus	An occasional visitor to the region, though was probably resident prior to clearing.		
Birds	VU	Malleefowl	Leipoa ocellata	Broadly distributed across the region.	The species benefits from DEC's Western Shield baiting programs, there are Malleefowl protection groups across the Wheatbelt and the species has a high profile and level of concern across the Wheatbelt	
Birds	VU	Forest Red-tailed Black-Cockatoo	Calyptorhynchus banksii naso	The only records are old records west of Northam, on the edge of the region; considered not resident		
Birds	VU	Western Rosella (inland ssp)	Platycercus icterotis xanthogenys	Records from the west and south of the region also east of the clearing line	None	Need more survey
Birds	VU	Australian Painted Snipe	Rostratula benghalensis australis	Only two records from 2002, considered an occasional visitor.	None	Need more survey
Birds	P2	Black Bittern	Ninox connivens connivens	A single record from the 1960s	None	See document
Birds	P3	Masked Owl (SW ssp)	Ixobrychus flavicollis australis	Few regional records	None	See document
Birds	P3	Rufous Fieldwren (western wheatbelt)	Tyto novaehollandiae novaehollandia	Few regional records	None	See document
Birds	P4	Shy Heathwren (western ssp)	Calamanthus campestris montanellus	Few regional records	None	See document
Birds	P4	Bush Stonecurlew	Hylacola cauta whitlocki	Few regional records	None	See document
Birds	P4	Hooded Plover	Burhinus grallarius	Few regional records	None	See document
Birds	P4	Western Whipbird (sthn WA subsp)	Charadrius rubricollis	Few regional records	None	See document
Birds	P4	Australian Bustard	Psophodes nigrogularis oberon	Few regional records	None	See document
Birds	P4	Crested Shrike-tit (south-western ss	Ardeotis australis	Few regional records	None	See document
Birds	P4	Crested Bellbird (southern)	Falcunculus frontatus leucogaster	Few regional records	None	See document
Birds	P4	White-browed Babbler (western wheatbelt)	Pomatostomus superciliosus ashbyi	Few regional records	None	See document
Invert	EX	Snail	Bothriembryon praecelsus	Considered extinct with the only record for this species from near Kelleberrin.	None	Taxonomic work and further survey, see report for detail.
Invert	CR	Yorkrakine Trapdoor Spider	Kwonkan eboracum	Few scattered populations	Interim Conservation Plan in draft for Avon, through ACC funding.	Fund and follow recommendations from plan
Invert	CR	Arid bronze azure butterfly	Ogyris subterrestris petrina	Single population known for this ANRMR endemic	Through ACC funding, the population is being surveyed to assess current status and habitat preferences, new population searches are being undertaken and a recovery team is being formed.	Fund and follow recommendations from report
Invert	CR	Minnivale Trapdoor Spider	Teyl sp (BY Main 1953/2683, 1984/13	Few scattered populations	Interim Conservation Plan in draft for Avon, through ACC funding.	Fund and follow recommendations from plan
Invert	EN	Tree-stem Trapdoor Spider	Aganippe castellum	Few scattered populations, more populations found with ACC funding	Interim Conservation Plan in draft for Avon, through ACC funding.	Fund and follow recommendations from plan
Invert	VU	Shield-backed Trapdoor Spider	Idiosoma nigrum	Few scattered populations, more populations found with ACC funding	Interim Conservation Plan in draft for Avon, through ACC funding.	Fund and follow recommendations from plan
Invert	P1	Brine Shrimp	Branchinella simplex	Little known, but known also from outside the ANRMR	None	Further survey across range to determine status
Invert	P1	Water Flea	Daphnia jollyi	Little known, but known from outside the ANRMR	None	Further survey across range to determine status

GROUP	Status	Common Name	Scientific Name	Regional Status	Current Actions	Required further Actions
Invert	P1	Brine Shrimp	Parartemia contracta	Little known, but known also from outside the ANRMR	None	Further survey across range to determine status
Invert	P1	Bush Cricket	Ixalodectes flectocercus	Little known, currently known only from the ANRMR	None	Further survey.
Invert	P1	Snail	Bothriembryon bradshawi	Little known, but known also from outside the ANRMR	None	Taxonomic work and further survey, see report for detail.
Invert	P3	Bee	Hylaeus globuliferus	Little known, but known also from outside the ANRMR	None	Further survey across range to determine status
Invert	P4	Bivalve	Westralunio carteri	Little known, but known also from outside the ANRMR	None	Further survey across range to determine status
Mammals	EN	Red-tailed Phascogale,	Phascogale calura	Numerous known locations more recent records from southern and western parts of region	Project looking at key populations and habitat use, conservation management plan (funded by the ACC) in preparation.	Fund and follow recommendations from plan
Mammals	EN	Western Barred Bandicoot, Marl	Perameles bougainville bougainville	Locally extinct		
Mammals	EN	Woylie	Bettongia penicillata ogilbyi	Numerous populations generally in Nature Reserves being fox baited under DEC's Western Shield program	Fox baiting; current research program looking at Woylie decline.	Ongoing research into decline
Mammals	VU	Greater Stick-nest Rat, Wopilkara	Leporillus conditor	Extinct		
Mammals	VU	Heath Mouse, Dayang	Pseudomys shortridgei	Known only from a couple of populations in the region (Dragon Rocks and Lake Magenta Nature Reserve	Poorly understood ecology; PhD currently being completed soon with management actions	See recovery action output from PhD and consider direction.
Mammals	VU	Chuditch	Dasyurus geoffroii	Across the south-west	Fox baiting, management plan (out of date)	Ongoing monitoring
Mammals	VU	Banded Hare-wallaby, Mernine	Lagostrophus fasciatus fasciatus	Locally extinct		
Mammals	VU	Black-flanked Rock-wallaby	Petrogale lateralis lateralis	Up to seven populations	Conservation management plan for the species for the Central Wheatbelt and benefits from fox baiting through Western Shield	Fund and follow recommendations from plan
Mammals	VU	Numbat, Walpurti	Myrmecobius fasciatus	A few populations (Tutanning)	Baiting, some ongoing research	
Mammals	VU	Bilby, Dalgyte, Ninu	Macrotis lagotis	Locally extinct		
Mammals	P4	Water-rat, Rakali	Hydromys chrysogaster	Some recent records near York.	None	Survey near Northam to see if species is still there.
Mammals	P4	Western Mouse	Pseudomys occidentalis	Found in numerous Nature Reserves	Fox baiting	Need regular survey program developed to ensure that known populations are secure.
Mammals	P4	Central Long-eared Bat	Nyctophilus timoriensis (central form)	Generally found in eastern edge of ANRMR	None	Further survey
Mammals	P4	Western Brush Wallaby	Macropus irma	Generally found in western and southern edge of ANRMR	Benefits from fox baiting programs	None
Mammals	P5	Tammar Wallaby	Macropus eugenii derbianus	Generally found in western and southern edge of ANRMR	Benefits from fox baiting programs	None
Mammals	P5	Quenda	Isoodon obesulus fusciventer	Few recent records may only be found now in Tutanning Nature Reserve.	Benefits from fox baiting programs	Survey to confirm locations.
Reptiles	VU	Cyclodomorphus skink	Cyclodomorphus branchialis	Only found on eastern edge.	None	Further survey
Reptiles	VU	Western Spiny-tailed Skink	Egernia stokesii badia	Several, some recently found ,populations.	Successful Avon project finding new populations, recovery plan in preparation	Ongoing survey and monitoring success of on-ground work.
Reptiles	P3	Black-striped Snake	Neelaps calonotos	Probably does not live in the region, the one record from the ANRMR is considered erroneous		
Reptiles	P3	Lake Cronin Snake	Paraplocephalus atriceps	Only in western edge of region	None	See relevant section
Reptiles	P4	Carpet Python	Morelia spilota imbricata			

Table 1: A review of the current knowledge of the Threatened and Priority fauna of the ANRMR (from DEC's Threatened and Priority Fauna dB.

Appendix 1 Vegetation Communities Benchmarking Status Report

Judith Harvey commenced with the Avon Baseline project on 27th January 2009
She has over 20 yrs experience in vegetation surveys, mapping and ecological research in the Wheatbelt and last year worked on a federally funded project developing methodology to assess and monitor vegetation condition. This current project forms a very good case study of those methods.

Aims

1. To identify Avon [Woodland] vegetation communities (by 13 March 2009)
2. To describe these communities based on analysis of 637 floristic surveys, GIS analysis, Baseline vegetation mapping and expert opinion. (31 March 2009)
3. To develop condition assessment methodology based on
    a. a review of eastern state methodology,
    b. relevant floristic data e.g. weed species and life form information
    c. available sites photographs
    d. additional field data (17th April)
4. To conduct a pilot study collecting field data for selected (priority) communities. (31 May 2009)
5. To prepare of benchmark descriptions of the selected communities. (12 June)

Progress

1. Twenty two initial groups were identified with six of these needing further subdivisions. Four of these six have had floristic, GIS and photographic data compiled and analysed and now await input from Greg Keighery who has been on leave until 23rd Feb.
2. Compilation of community description spreadsheet for incorporation into a database based on the floristic analysis by Ted Griffin
3. Draft of 2 page community description form
4. Preliminary preparation of selection of condition assessment attributes and field data sheets.

Outputs

A set of 2 page descriptions with photographs, maps and list of dominant and indicator species for over 20 Wheatbelt woodland communities.

Additional a condition assessment and target values for virtual Benchmarks for selected Wheatbelt woodland communities.

Report on outcomes and findings. Recommendations for future work (26 June 2009).

Potential recommendations

1. Extension of pilot study to include, threatened, common or all woodlands communities.
2. Extension to other vegetation types, e.g. Kwongan, mallee.
3. Assessment of a range of conditions of a woodland community against its benchmark.
4. Setting up a ling term monitoring program to assess changes in condition due to dedicated management activities.