Gnangara Sustainability Strategy

An across-government initiative

Groundwater – Biodiversity – Land use

# BIODIVERSITY OF TERRESTRIAL VERTEBRATES IN THE GNANGARA SUSTAINABILITY STRATEGY STUDY AREA – A PRELIMINARY REPORT

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# Biodiversity of terrestrial vertebrates in the Gnangara Sustainability Strategy study area – a preliminary report.

A Report for the Gnangara Sustainability Strategy and the Department of Environment and Conservation

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This document has been commissioned/produced as part of the Gnangara Sustainability Strategy (GSS). The GSS is a State Government initiative which aims to provide a framework for a whole of government approach to address land use and water planning issues associated with the Gnangara groundwater system. For more information go to www.gnangara.water.wa.gov.au

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Front cover: Common Scaly Foot *Pygopus lepidopodus*, Yeal Nature Reserve, Conservation Officer N.Huang and A. Reaveley holding a Western Bluetongue *Tiliqua occipitalis* and a Honey Possum *Tarsipes rostratus*. (All photos, except Yeal Nature Reserve, accredited to L. Valentine).

# Biodiversity of the terrestrial vertebrates in the Gnangara Sustainability Strategy study area – a preliminary report

## Introduction

The Gnangara Groundwater System is located on the Swan Coastal Plain (SWA2) IBRA sub-region, north of the Swan River, Perth, Western Australia. The groundwater system consists of an unconfined, superficial aquifer known as the Gnangara Mound that overlies the confined Leederville and Yarragadee aquifers, as well as the smaller Mirrabooka and Kings Park aquifers (Government of Western Australia 2008). The groundwater system is directly recharged by rainfall and provides Perth with approximately 60% of its water. In addition, the area supports numerous significant biodiversity assets including: the largest patch of remnant vegetation on the Swan Coastal Plain, south of the Moore River; a number of Bush Forever sites; numerous threatened species and ecological communities; and, a suite of approximately 600 wetlands.

The impacts of a drying climate and declining groundwater levels are of concern on the Gnangara Groundwater System (Horwitz et al 2008; Government of Western Australia 2008). In addition, there are a number of other threatening processes to biodiversity in the region, including habitat clearing and fragmentation, *Phytophthora cinnamomi* and altered fire regimes (Mitchell et al 2003). The multi-agency taskforce Gnangara Sustainability Strategy (GSS) was initiated in 2007 to provide a framework for balancing water, land and environmental issues; and to develop a water management regime that is socially, economically and environmentally sustainable for the Gnangara Sustainability Strategy study area (Government of Western Australia 2008; Figure 1).

The ability to develop successful planning relies on the quality of the biodiversity information (Pressey 1999; Wilson et al. 2005). However, our current understanding of biodiversity values, ecosystem processes and the dynamics of the Gnangara Groundwater System, particularly at landscapes scales, are inadequate. Gaps in our capacity to measure impacts on biodiversity, landscape condition and ecosystem processes as a result of disturbances (e.g. climate change, changed water regimes, fire and plant pathogens) are likely to result in ineffective management actions with low quality outcomes.

# Patterns of vertebrate biodiversity in the GSS study area

As an integral member of the GSS, the DEC initiated a project to examine the 'Biodiversity Values of the Gnangara Mound', aimed at assessing the biodiversity assets and identifying threatening processes to fauna and flora in the GSS study area. The GSS study area includes the largest contiguous remnant vegetation patch on the Swan Coastal Plain, of which a large proportion is DEC-managed estate. One of the biodiversity projects was designed to examine patterns in faunal diversity across a variety of landforms, vegetation types and fuel ages in the north and eastern part of the GSS study area, as well as the abundance and distribution of wetland-associated mammal species (Figure 1). A summary of this project is outlined below.

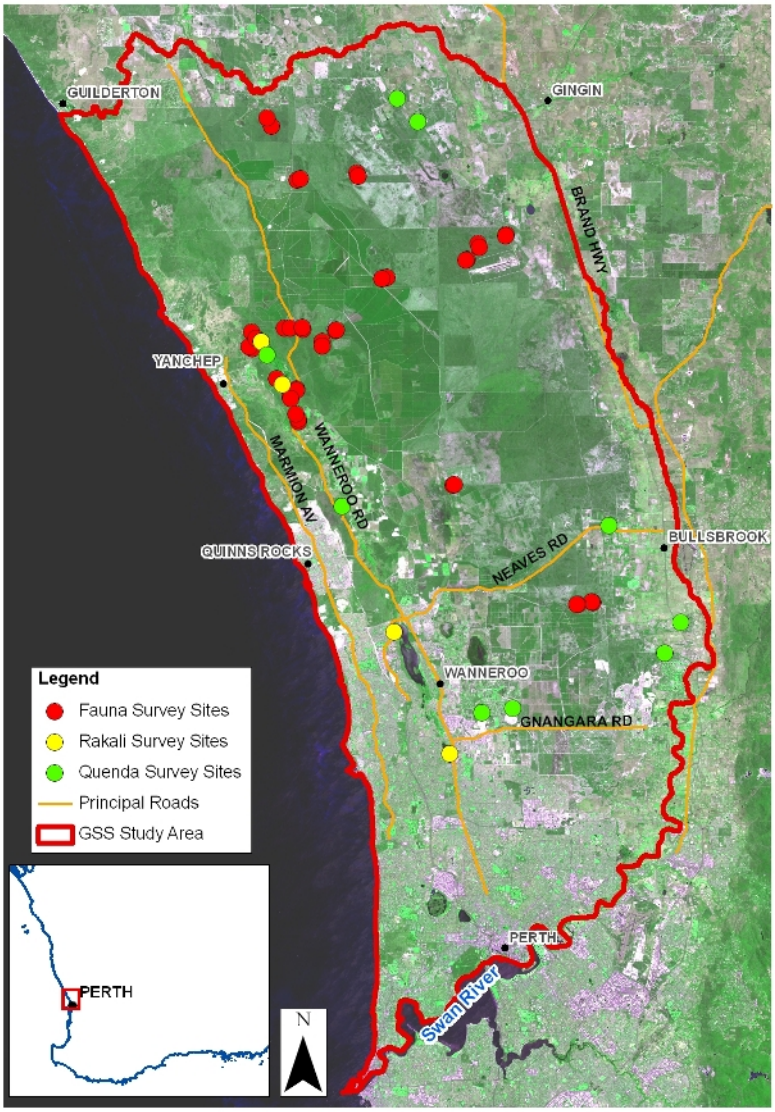


Figure 1. Map of GSS study area and fauna trapping sites, including areas targeted for Quenda and Rakali.

## *Ground-dwelling Vertebrate Fauna Trapping*

A number of sites (n = 40, representing 20 paired sites within an area; Figure 1) were selected to represent the range of landform units (Quindalup, Spearwood and Bassendean), vegetation associations (*Banksia* woodland, coastal scrub, Jarrah forest, Tuart forest and *Melaleuca* wet or dampland) and fuel ages (< 8 years and > 16 years) in the GSS study area (Figure 2).


Figure 2. Representative habitats surveyed during fauna trapping, including: *Melaleuca* wet and damplands (a, d and f), *Banksia* woodland (b, e and g) and Jarrah forest (c).

Sites were surveyed for ground-dwelling vertebrate fauna using pit-fall traps (20 L buckets), aluminium box traps (Elliots) and cage traps (Sheffields) (Figure 3). Surveys occurred during spring 2007, and autumn and spring 2008 to determine species richness, abundance and composition. Preliminary results presented here are from the spring 2007 and autumn 2008 trapping sessions.


Figure 3. a) Pit-fall trap and drift-fence, b) *Rankinia adelaidensis adelaidensis* captured in pit-fall trap, c) Conservation Officer N. Huang with a *Helioporus eyrie*, and d) Elliot and Sheffield cage traps.

A total of 35 reptile species, 5 frog species and 14 mammal species were captured or observed during surveys (Table 1; Figure 4). The most widespread species were the skinks *Lerista elegans, Cryptoblepharus plagiocephalus* and *Menetia greyii*. The frog *Heleioporus eyrei* was the most abundant frog species, while the Honey possum *Tarsipes rostratus* was the most frequently trapped mammal.


Figure 4. Some species captured during trapping sessions: the skinks a) *Morethia obscura*, b) *Lerista elegans* and c) *Ctenotus fallens*; the agamid d) *Rankinia adelaidensis adelaidensis*; the elapid e) *Parasuta gouldii*; the pygopod *Lialis burtonis*; and the frogs g) *Heleioporus eyrie*; h) *Myobatrachus gouldii* and i) *Limnodynastes dorsalis*.

Preliminary results indicate that landform unit, vegetation type and time since fire all influence reptile species richness, abundance and community assemblages. Reptile species richness was highest at sites on Bassendean soils in *Banksia* woodland with an old fuel age, followed by sites on Quindalup dunes in coastal scrub. Reptile abundance also differed among vegetation types, with total abundance greater in Tuart forest compared to *Melaleuca* dampland. In addition, the composition of reptile communities varied among vegetation types, with *Banksia* and *Melaleuca* sites grouping separately, probably reflecting differences in the habitat requirements of species.

Four species of reptiles were only captured once during the trapping surveys and several species captured during trapping (n = 5) are recognised as being endemic to the Swan Coastal Plain (Table 1). In addition, the Priority reptile species *Neelaps calonotos* was captured at two sites on Bassendean sands in *Banksia* and *Melaleuca* woodland with old fire age.

Table 1. Species captured or observed during trapping sessions in the GSS study area, including targeted mammal trapping. Species nomenclature primarily follows the Westralian Australian Museum database (October 2008); ^ denotes common names of reptiles obtained from Bush et al. 2007.

| Family | Species | Common Name |
|---|---|---|
| | **AMPHIBIANS** | |
| | ***Frogs: Class Amphibia, Order Salientia*** | |
| Myobatrachidae | *Crinia insignifera* | Squelching Froglet |
| | *Heleioporus eyrei* | Moaning Frog |
| | *Limnodynastes dorsalis* | Banjo Frog |
| | *Myobatrachus gouldii* | Turtle Frog |
| | *Pseudophryne guentheri* | Günther's Toadlet |
| | **REPTILES** | |
| | ***Lizards: Class Reptilia, Order Squamata, Suborder Sauria*** | |
| Gekkonidae | *Christinus marmoratus* | Marbled Gecko |
| | *Strophurus spinigerus spinigerus* | South-western Spiny-tailed Gecko |
| Pygopodidae | *Aprasia repens* | Southwestern Sandplain Worm Lizard |
| | *Delma (Aclys) concinna concinna*[a,b] | West Coast Javelin Lizard^ |
| | *Delma fraseri* | Fraser's Legless Lizard |
| | *Delma grayii* | Gray's Legless Lizard |
| | *Lialis burtonis* | Burton's Legless Lizard |
| | *Pletholax gracilis gracilis*[a] | West Coast Keeled Legless Lizard^ |
| | *Pygopus lepidopodus* | Common Scaly Foot |
| Agamidae | *Pogona minor minor* | Dwarf Bearded Dragon |
| | *Rankinia adelaidensis adelaidensis*[a] | Western Heath Dragon |
| Varanidae | *Varanus gouldii** | Gould's Monitor |
| | *Varanus rosenbergi** | Southern Heath Monitor |

| | | |
|---|---|---|
| Scincidae | *Acritoscincus trilineatum* | Southwestern Cool Skink^ |
| | *Cryptoblepharus plagiocephalus* | Fence Skink |
| | *Ctenotus australis* | West Coast Long-tailed Ctenotus |
| | *Ctenotus fallens* | West Coast Ctenotus^ |
| | *Egernia kingii** | King's Skink |
| | *Egernia napoleonis* | Southwestern Crevice Skink |
| | *Hemiergis quadrilieata*[a] | Two-toed Mulch Skink^ |
| | *Lerista elegans* | West Coast Four-toed Lerista |
| | *Lerista lineopunctulata*[a,b] | Line-spotted Robust Lerista^ |
| | *Lerista praepedita* | West Coast Worm Lerista^ |
| | *Menetia greyii* | Common Dwarf Skink |
| | *Morethia lineoocellata* | West Coast Pale-flecked Morethia^ |
| | *Morethia obscura* | Southern Pale-flecked Morethia |
| | *Tiliqua occipitalis* | Western Bluetongue |
| | *Tiliqua rugosa rugosa* | Bobtail |
| | ***Snakes: Suborder Serpentes*** | |
| Elapidae | *Brachyurophis semifasciata*[b] | Southern Shovel-nosed Snake |
| | *Demanisa psammophis reticulata*[b] | Yellow-faced Whip Snake |
| | *Neelaps calonotos*[a,c] | Black-striped Snake |
| | *Notechis scutatus* | Tiger Snake |
| | *Parasuta gouldii* | Gould's Snake |
| | *Pseudonaja affinis affinis* | Dugite |
| | *Simoselaps bertholdi* | Jan's Banded Snake |
| | **MAMMALS** | |
| | ***Monotremes: Subclass Prototheria, Order Monotremata*** | |
| Tachyglossidae | *Tachyglossus aculeatus* | Echidna |
| | ***Marsupial Mammals: Subclass Marsupialia, Order Peramelemorphia*** | |
| Peramelidae | *Isoodon obesulus fusciventer*[e] | Southern Brown Bandicoot (Quenda) |
| | ***Order Diprotodontia, Suborder Phalangerida*** | |
| Tarsipedidae | *Tarsipes rostratus* | Honey Possum (Noolbenger) |
| Macropodidae | *Macropus fuliginosus** | Western Grey Kangaroo |
| | *Macropus irma* | Western Brush Wallaby |
| | ***Eutherian Mammals: Subclass Eutheria, Order Rodentia*** | |
| Muridae | *Hydromys chrysogaster*[e] | Water Rat (Rakali) |
| | *Mus musculus*[d] | House Mouse |
| | *Rattus fuscipes* | Bush Rat (Mootit) |
| | *Rattus rattus*[d,e] | Black Rat |
| | ***Order Carnivora*** | |
| Canidae | *Vulpes vulpes** | Fox |
| Felidae | *Felis catus* | Cat |
| | ***Order Lagomorpha*** | |
| Leporidae | *Oryctolagus cuniculus*[e] | Rabbit |
| | ***Order Artiodactyla*** | |
| Suidae | *Sus scrofa** | Pig |
| Bovidae | *Capra hicrus** | Feral Goat |

* Species not trapped - observed only by incidental observations

[a] Species endemic to Swan Coastal Plain

[b] Reptile species only captured at one site

[c] Priority-listed species

[d] Introduced species

[e] Species only captured during targeted trapping for wetland-associated mammals

## *Targeted trapping for wetland-associated Mammals*

Mammal species that are currently extant in the GSS but potentially threatened by declining rainfall and groundwater levels include the Quenda (Southern Brown Bandicoot, *Isoodon obesulus*) and Rakali (Water Rat, *Hydromys chrysogaster*). General trapping surveys conducted across a range of landform units, vegetation types and fuel ages failed to locate these two species of mammals. Consequently, targeted trapping using wire cages (Sheffield) for both species began in May 2008, with a specific focus on wetland sites (Figure 5).

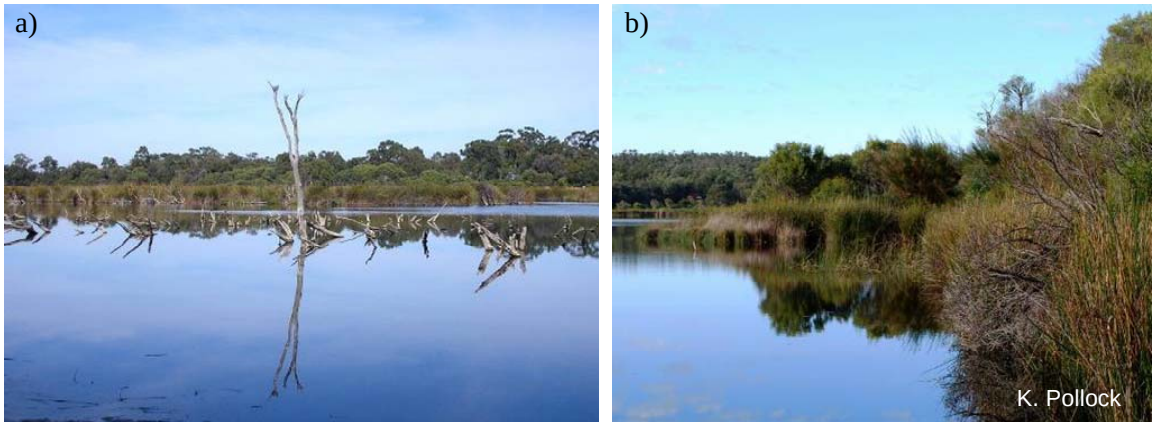


Figure 5. a) Lake Goollelal and b) Lake Loch McNess, sites trapped for Quenda or Rakali.

Quenda were trapped at five of the six targeted sites, all near permanent wetlands or intermittent swamps and damplands (Figure 5, Figure 6). The highest abundance of Quenda was observed at Twin Swamps Nature Reserve, which may reflect the control of introduced predators at this site (*via* fencing and baiting). The presence of Quenda at a site was associated with a dense mid-storey shrub layer (0.5 – 1.5 m high), typical of damplands and wetlands. The trapping for Rakali was located at three permanent water bodies, with Rakali observed at all targeted sites, but with the greatest abundance at Lake Goolellal. In addition to the capture of Quenda and Rakali (Figure 6), a number of other mammal species were captured during the targeted surveys, including the Black Rat *Rattus rattus* and the Bush Rat *Rattus fuscipes* (Table 1).


Figure 6. a) Conservation Officer A. Reaveley holding a Rakali; b) a juvenile Quenda and c) a Bush Rat captured during targeted mammal trapping.

## Preliminary Conclusion

The preliminary results indicate that landform unit, vegetation type and time since fire are all important factors contributing towards the diversity and distribution of reptile communities in the GSS study area. Further analyses will provide insight into the relative importance of these factors and identify specific species habitat preferences. Quenda and Rakali are both present in the GSS study area, but are restricted to particular habitat types. Additional analyses will examine key habitat requirements for these species, and assess the risk of declining groundwater and rainfall on the GSS populations. The project "Biodiversity Values of the Gnangara Mound" is nearly complete, with final statistical analyses planned in early 2009. Results will provide insight into the vertebrate biodiversity assets in the area and the processes influencing biodiversity as well as identifying specific species at risk from threatening processes.

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