

# **Champion Lakes Master Plan; Fauna**

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## INTRODUCTION

The Champion Lakes project is a recreational park in the City of Armadale incorporating land and water based activities. It takes in Wright Lake and extends south-west to the Southern River. The proposal includes a golf course, equestrian facilities, sporting stadiums, playing fields, a cable ski park, a canoeing trail and possibly a rowing course, a residential area and some land set aside for conservation. It also includes modification of Wright Lake. As part of the development of the Champion Lakes Master Plan, a Public Environmental Review is being prepared by Bowman Bishaw Gorham Environmental Management Consultants, and we have been commissioned to review issues relating to fauna. Guidelines for this fauna component prepared by the Environmental Protection Authority are as follows:

- Undertake baseline studies to identify existing fauna and particularly the importance of Wright Lake for waterbirds and the presence of fauna of conservation significance;
- Discuss direct and indirect impacts of the proposal upon fauna, including the potential risk associated with introduced species;
- Propose management measures for the protection and enhancement of fauna values.

## METHODS

### Site Description

The study area consists of the existing Champion Lakes Recreational Park, including Wright Lake. Main features of the site with respect to habitat for fauna are:

- Wright Lake. A seasonal, brackish wetland with a margin of sedges and scattered trees. There is a caravan park adjacent to the lake. There is little upland vegetation near to the lake, with only small patches to the west and south-west. The lake is separated from other parts of the park by Camillo Road. The proposal will see Wright Lake deepened, made permanent and have its salinity reduced. The proposal would also see the creation of an island as a wildlife refuge and some rehabilitation of shoreline vegetation.
- Farmland. Almost all land between Wright Lake and the Southern River. The habitat consists of pasture with scattered trees and livestock are present. The proposal would see this area developed for sports and residential purposes.
- Remnant vegetation. Some remnant vegetation occurs within the farmland between Wright Lake and the Southern River. This is very degraded through grazing but contains some remnant native vegetation, particularly paperbark trees *Melaleuca* sp. along a small watercourse. Part of this area is proposed to be rehabilitated for conservation, with either an artificial stream or broad rowing course also being placed through this area. Note that there is remnant upland vegetation north of Wright Lake that will be separated from the Lake by the extension of Tonkin Highway.
- Southern conservation area. This includes the Southern River that has a weed-invaded riparian zone of paperbarks *Melaleuca* spp.. Woodlands of Marri *Corymbia calophylla* and paperbark *Melaleuca* spp. are heavily weed-invaded with little native understorey vegetation. Some weed-invaded areas of heath are present and parts of the area are seasonally inundated. This area is

proposed to be retained for conservation to provide a link between the Southern River and conservation areas in the buffer and around Wright Lake.

### **Sources of Information**

Because fauna of the Perth region, and particularly vertebrate fauna, is comparatively well known, the baseline study consisted of a detailed site inspection carried out on the 6<sup>th</sup> and 7<sup>th</sup> of March 2002, and a review of fauna known from the region. The baseline study allows for conspicuous species to be recorded and fauna habitats to be identified and involved spending 9.5 hours on the site. This included over 2 hours at night taking recordings with an Anabat II Bat Detector for later analysis to determine the bat species present. The review allows for the listing of species known to occur in the region in the sorts of habitats present at the site. Therefore, many of the species that can be listed for the site are only predicted to occur there, but even intensive sampling can only yield a proportion of the species that use a site because of the limitations of sampling techniques, and annual and seasonal variation in the presence of species.

Sources of such general information included WA Museum specimen records from the general region, personal observations from previous studies carried out in the area, observations on birds in the Perth area from Van Delft (1997), observations on reptiles in the Perth area from Bush *et al.* (1995), the results of a number of studies on the vertebrate fauna of bushland remnants in the Perth region (eg. Storr *et al.* 1978, Wykes 1991, How 1998, Turpin 1990, Storr and Johnstone 1988, How and Dell 1994, Dell and How 1995 and Johnstone and Storr 1998), and species listed for the region in Perth's Bush Forever (Government of Western Australia 2000). CALM's Threatened Fauna Database was used to determine if any threatened fauna had been recorded in the general region of the study area. The review also accessed waterbird count data available for Wright Lake, in databases maintained by the WA Department of Conservation and Land Management (CALM) and Birds Australia WA Inc.

CALM's Threatened Fauna Database includes threatened invertebrates. Aquatic macro-invertebrates were sampled in Wright Lake on 5<sup>th</sup> October 1995 (L. Charlton pers. comm.) and results from this work were obtained. Comments on the aquatic macro-invertebrates of Wright Lake were also received from A. Parker, who carried out some sampling in the lake in the late 1990s, and discussions were held with Dr J. Davis of Murdoch University.

### **Assessment of conservation significance**

The conservation status of fauna species is assessed under Federal and State Acts such as the Commonwealth Environmental Protection and Biodiversity Conservation Act (EPBC Act 1999) and the WA Wildlife Conservation Act. These use levels of significance recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN) and reviewed by Mace and Stuart (1994), although the WA Act also has a category of "Other Specially Protected Fauna" that has no equivalent IUCN level. These categories are described in Appendix One.

The EPBC Act also has separate listings for migratory and marine species. Migratory species are largely those listed under the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals), the Japan Australia Migratory Bird Agreement and the China Australia Migratory Bird Agreement. There is some ambiguity regarding the inclusion of non-migratory species that belong to families listed as migratory, but these species have been excluded from a truly migratory list provided by Environment Australia. The WA Department of Environmental Protection (DEP) also excludes non-migratory members of families listed under the Migratory Category of the EPBC Act. The Marine Species list includes all birds recorded in the marine waters of the Commonwealth of Australia, with individual species not listed on Environment Australia's website. Marine species are not generally applicable to the study areas.

In addition, Environment Australia has supported the publication of a report on the conservation status of Australian reptiles (Cogger *et al.* 1993) and birds (Garnett and Crowley 2000). Garnett and Crowley use the IUCN categories but in some cases assign species differently compared with the EPBC Act, while the categories used by Cogger *et al.* (1993) differ in some respects as this report pre-dates Mace and Stuart's review.

In Western Australia, the Department of Conservation and Land Management has produced a supplementary list of Priority fauna, being species that are not considered Threatened under the IUCN categories or under the WA Wildlife Conservation Act but for which the Department feels there is cause for concern. Levels of Priority are described in Appendix One.

Species can be considered to be of National Conservation Significance if they occur on any of the above lists. Species not on these lists may be of Regional Conservation Significance if they occur on the edge of their distribution or as an isolated population.

## **Nomenclature**

Taxonomic orders and names used in this report generally follow Tyler *et al.* (1984) for amphibians, Storr *et al.* (1983, 1986, 1990 and 1999) for reptiles (common names for amphibians and reptiles from Bush *et al.* 1995), Strahan (1983) for mammals and Christidis and Boles (1994) for birds. Where recent taxonomic revisions have occurred, earlier names are given in parenthesis.

## **FAUNA OF THE CHAMPION LAKES PROJECT AREA**

Fauna species observed or expected on the site are indicated on Tables 1, 2, 3 and 4. In the case of invertebrates, only species classed as threatened have been listed, while for vertebrates, all species observed or expected to be present have been included. Species known from the region but for which there appears to be no suitable habitat, or that are believed to be extinct in the Perth region, have been excluded. The site may support 3 threatened invertebrate species, 9 species of frogs, 39 species of reptiles, 122 species of birds and 24 species of mammals (19 native and 5 introduced).

In the following sections, each fauna group is discussed in terms of the species present, species of conservation significance, important habitats, impacts of the proposal and impact management. Tables 2, 3 and 4 classify each vertebrate species according to their National or Regional Conservation Significance (see Methods for descriptions of these). Information on threatened fauna, habitats, impacts and impact management are drawn together for all groups in the Discussion (see below).

## **Invertebrates**

No site-specific information on terrestrial invertebrates is available for the site, but some studies have been carried out on aquatic macro-invertebrates of Wright Lake. Species recorded by L. Charlton (pers. comm.) in October 1995 are listed on Table 1. These species are typical of those documented in wetlands of the Swan Coastal Plain by Davis and Christidis (1997) and most are associated with freshwater. However, A. Parker (pers. comm.), who has also worked on aquatic macro-invertebrates in Wright Lake, has noted that the composition of the lake's invertebrate fauna changes with seasonal changes in salinity. Species associated with freshwater are abundant when salinity levels are low, but species associated with saline water replace these as water levels fall and salinity increases. This combination of freshwater and saline species is considered unusual among wetlands of the Swan Coastal Plain, even though the species themselves are not.

Three species of native bee that are of national conservation significance have been recorded in the vicinity of the Champion Lakes Recreation Park. *Leioproctus douglasiellus* and *Neopasiphae simplicior* are both listed under Schedule 1 of the WA Wildlife Conservation Act and have been recorded at Armadale Golf Course and Lake Forrestdale, while *L. contrarius* is listed as Priority 3 by CALM, and has been recorded at Forrestdale and Murdoch. The latter species may be more widespread than this listing justifies. *L. douglasiellus* has been recorded only from flowers of *Goodenia filiformis*, *N. simplicior* only from flowers of *G. filiformis*, *Lobelia tenulor* and *Angianthus preissianus*, and *L. contrarius* only from flowers of Goodeniaceae and possibly *Lechenaultia stenosepala*. Discussions with botanists working on the Champion Lakes project are needed to determine if these plant species are present. If they are, then it seems very likely that the 3 bee species will also be present.

In addition to the above threatened species that may be present, the Monarch or Wanderer Butterfly *Danaus plexippus* was observed during the site inspection. Although self-introduced and reliant on introduced plants for food, this butterfly is listed as migratory under the EPBC Act. It was present in weed-infested areas near Southern River.

## Frogs

Although no frog species were recorded during the site inspection, on the basis of patterns of distribution and the habitats present, all nine species known from the Swan Coastal Plain south of the Swan River are almost certainly present (Table 2). This reflects the presence of seasonal wetlands and the juxtaposition of Southern River. It is not clear to what extent Wright Lake may be important for frogs, as all local species are intolerant of even brackish water. The Turtle Frog is an entirely terrestrial species that may occur in upland areas throughout its life cycle (Roberts 1981), while the remaining species have aquatic larvae but utilise terrestrial habitats to varying degrees as adults. The Moaning Frog and Pobblebonk are particularly terrestrial as adults (Bush *et al.* 1995, Bamford 1992) and the Moaning Frog is also dependent upon natural seasonal fluctuations in the water level of wetlands where it breeds.

None of the frogs is of National or Regional Conservation Significance. Locally, however, the seasonal wetlands close to Southern River may be important in maintaining frog populations in the area.

## Reptiles

Small areas of remnant native vegetation in the Perth region, even when degraded, retain a substantially intact reptile fauna (How and Dell 1994). Therefore, the project area is expected to support a rich reptile fauna (Table 2), although this will not be evenly distributed. For example, the Long-necked Tortoise is aquatic and can be expected in Southern River, as well as seasonally visiting wetlands in the area, including Wright Lake. The South-West Cool Skink, Mourning Skink and Tiger Snake are closely associated with riparian habitats around wetlands and may therefore be confined to such areas on the site, such as around Southern River and the margins of Wright Lake. All remaining species depend upon upland habitats of the site and are therefore most likely to be encountered in the two remnants of upland vegetation near Wright Lake, and close to Southern River. Several of the skink species in particular survive and even thrive in disturbed environments, so may be widespread even in pasture areas. These include the Dwarf Skink and the Bobtail.

A number of reptile species are considered of Regional Conservation Significance because they are at the limit of their distribution in the area (see Table 2). The Sandhill Dragon, Black-headed Tree Goanna, Worm Lerista, Western Bluetongue, Narrow-banded Snake and Half-ringed Snake are at the southern limit of their range just south of the Swan River, while Rosenberg's Goanna, the Perth Lined Lerista and Crowned Snake are at the northern limit of their range. The Worm Lerista and Perth Lined Lerista may persist despite the development, as they occur at high population densities and are known to survive in gardens. In contrast, the tree goanna, bluetongue and three snake species occur at low population densities so may not have viable population sizes if development reduces the area of habitat available to them.

Two species are of National Conservation Significance: the Perth Lined Lerista is listed as Rare or Insufficiently Known and the Black-striped Snake is listed as Endangered by Cogger *et al.* (1993). Neither is recognised under Conservation Acts

or by CALM, however, probably because both are secure in reserves outside the metropolitan area.

## **Birds**

Because of the mobility of birds, well over a hundred species could probably be recorded at the site, but it is considered that only 122 species may make regular use of it, while 42 species were either observed during the site inspection or have been recorded during waterbird surveys (Table 3).

A high proportion of bird species observed or expected are waterbirds: all ducks, grebes, herons, cormorants, pelican, ibis, crakes, sandpipers, plovers and gulls, but also the Swamp Harrier, Reed-Warbler and Grassbird. Many of these have been counted on Wright Lake during waterbird surveys, including 7 species recorded breeding there. Wright Lake is the key waterbird habitat within the study area and while the counts are not exceptional (pooled maximum count of 829), with much higher counts at larger lakes nearby, such as Lake Forrestdale (pooled maximum count of 30,429 Jaensch *et al.* 1988), the lake is clearly of local importance. The number of breeding species is moderate, compared with 18 breeding species at Lake Forrestdale (Jaensch *et al.* 1988). Nearby Mary Carroll Park has a maximum count of 830 and 11 breeding species (Storey *et al.* 1993), and tends to act as a summer/autumn refuge when Wright Lake is dry.

In addition to Wright Lake, Southern River and nearby seasonal wetlands are also likely to be utilised by waterbirds, particularly for breeding, but these areas were dry with no waterbird activity during the site inspection. Areas of pasture are likely to be used by some waterbirds, such as the two ibis species and some ducks. Large trees in paddocks may be used for breeding by some ducks, such as the Australian Shelduck and Australian Wood Duck.

Remnant native vegetation in upland areas is important for dryland birds. Among the species recorded during the site inspection there are some, such as the Splendid Fairy-wren and Inland Thornbill, that are recognised as persisting in the metropolitan region only where native vegetation remains. They were observed only near the Southern River. Linkage of such areas of native vegetation is also important for these species as they can become locally extinct in small reserves (How and Dell 1995), and in this respect the project area is effectively part of a larger system linked via Southern River. Other species that are dependent upon native vegetation, such as the honeyeaters, are less reliant on linkages and can access isolated areas of native vegetation.

A number of the bird species observed or expected actually favour disturbed environments such as paddocks and parkland cleared woodland. In contrast with the species dependent upon native vegetation, species of disturbed and degraded environments tend to be widespread at least in the outskirts of Perth.

The only bird species that can be considered of Regional Conservation Significance are the Hooded Robin and the Golden Whistler. The Hooded Robin is considered to have disappeared from the Perth area (Sandilands 1995) but a pair was observed near

Jandakot Airport in March 2002 (P. Smith, pers. comm.), in habitat similar to some of the woodland on the Champion Lakes site. The Golden Whistler was once resident on the Coastal Plain but is now an infrequent visitor. It has not been observed in the study area but has been seen in woodland around North Lake (M. Bamford pers. obs.).

Fifteen species of National Conservation Significance are expected to use the site. Of these, 8 are listed as migratory under the EPBC Act and only one of these migratory species, the Great Egret, has actually been recorded. All the migratory species are waterbirds likely to make use of Wright Lake and seasonal wetlands in small numbers. Other species of National Conservation Significance are as follows:

- Freckled Duck – Priority 4 according to CALM and Least Concern according to Garnett and Crowley (2000);
- Little Bittern - Priority 4 according to CALM;
- Australasian Bittern - Vulnerable according to Garnett and Crowley (2000);
- Square-tailed Kite - classed as Priority 4 by CALM;
- Peregrine Falcon - Schedule 4 under the WA Wildlife Conservation Act;
- Barking Owl (southern race) - classed as near-Threatened by Garnett and Crowley (2000) and as Priority 2 by CALM;
- Short-billed Black-Cockatoo- Endangered under the WA Wildlife Conservation Act, the EPBC Act and according to Garnett and Crowley (2000).

Of these, the Freckled Duck, Little Bittern, Square-tailed Kite and Peregrine Falcon are not given high levels of significance and are likely to be infrequent visitors only. Some fringing rushes around Wright Lake may be suitable for the Little Bittern, while seasonal wetlands near Southern River may be suitable for the bittern and the Freckled Duck. The Square-tailed Kite is uncommon even as a visitor close to Perth, but several pairs of Peregrine Falcons are resident in the Perth area, so the site is probably within the range of one of these. Around Perth, Peregrine Falcons nest in large tree hollows, so there is a possibility of a pair nesting in one of the large trees on the site.

The Australasian Bittern, Barking Owl and Short-billed Black-Cockatoo have high levels of conservation significance. There is little suitable habitat for the Australasian Bittern, but some areas of rushes around Wright Lake and in seasonal wetlands near Southern River may be utilised infrequently. Similarly, there is limited habitat for Barking Owls, with perhaps some of the vegetation along Southern River being suitable. The Short-billed Black-Cockatoo relies on patches of native vegetation and pine plantations to maintain its presence in the Perth region, and within the study area, it may be a regular visitor to forage on the seeds of Banksias and Woody Pears.

## **Mammals**

The extant mammal fauna of the site is likely to be poor with only 14 native and 5 introduced species (Table 4), compared with as many as 16 mammal species that may be locally extinct. The number of extinct species is imprecise. This high level of extinction has been attributed to changes in fire regime, habitat loss and fragmentation, and predation by Foxes and Cats (Burbidge and McKenzie 1989, Paton 1991).



Several of the native mammal species listed as expected, including the Echidna, Honey Possum, Brush-tailed Possum and Western Grey Kangaroo, have been included because they are known from nearby, although the available habitat in the study area appears marginal for them. All rely to at least some extent on native vegetation, although the Grey Kangaroo will forage on pasture and the Brush-tailed Possum occurs in gardens, especially where homes provide access to roof space for shelter.

The remaining native mammal species are the Quenda (recorded), 8 species of bats (2 recorded and 2 possibly present, with the Chocolate Wattled Bat and possibly *F. mackenziei* recorded in Jandakot in March 2002 (B. Metcalf pers. comm.)) and the Rakali. The Quenda requires dense, low vegetation and was recorded amongst dense weeds on the south-eastern side of Wright Lake during the site inspection. It probably occurs throughout the study area where dense vegetation is present. The bats are all tree-roosting species that shelter under bark, and in crevices and hollows, and all may forage principally over native vegetation. The White-striped Bat is the only species that regularly forages over open ground and suburbs (M. Bamford pers. obs.). The Rakali may be present along Southern River but could seasonally visit Wright Lake.

A large proportion of the mammal fauna consists of introduced species and several of these were observed during the site inspection. This does not include domestic livestock, such as cattle, sheep and horses, that were present in farmland within the study area. Rabbit tracks were observed in several areas of remnant native vegetation and rabbits may contribute to the degradation of this vegetation by burrowing, browsing and through the introduction of weeds. Tracks of either a domestic or feral Cat were observed around Wright Lake, while a Fox was seen near Southern River.

The Honey Possum can be considered of Regional Conservation Significance because, while not classed as of National Significance, it has disappeared from much of the Perth Area (Perth's Bush Forever, Government of Western Australia 2000). However, it is unlikely that the Honey Possum is present as anything more than a vagrant. Three species present or likely to be present are of National Conservation Significance: the Quenda (listed as Priority 4 and Conservation Dependent by CALM), the bat *F. mackenziei* (Priority 4) and the Rakali or Water-Rat (Priority 4). The Quenda is present and probably common where there is dense, low vegetation, *F. mackenziei* may be present where native vegetation provides roosting and foraging areas, while the Rakali is likely to occur along Southern River.

## CONCLUSIONS

### General Fauna and Fauna Habitats

Although a rich fauna is predicted for the project area, many species, such as some mammals and birds, may only be present as vagrants. This is because much of the site is cleared and the fauna habitats therefore severely degraded, but there are larger areas of native vegetation nearby to support species that would probably not survive on the project area in isolation. The most significant fauna habitats in the project area are Wright Lake and adjacent upland areas, and in the vicinity of Southern River.

Cleared areas between Wright Lake and Southern River support species associated with farmland and remnant vegetation in this area may be important in providing linkage for fauna moving between the lake and the river.

Wright Lake appears to be unusual among lakes of the Swan Coastal Plain because it varies greatly in salinity over the course of a year, and this is apparently reflected in the composition of the aquatic macro-invertebrate fauna, which is reported to include both freshwater and saline species.

### Waterbirds

Wright Lake supports moderate numbers of waterbirds when seasonally inundated, including small numbers of migratory species. Although not documented, it could be used by large numbers of such species, such as the Red-necked Stint, over short periods of time when the lake is drying up. Most of the waterbirds that have been counted in moderately large numbers are ducks, grebes and rails that occur on fresh or brackish waters. They are largely species that feed on aquatic plants and invertebrates, although several of the ducks will also graze on lawns and take food from people, while the breeding species rely on fringing and emergent vegetation. The Australian Shelduck nests in tree hollows and may nest in adjacent paddocks.

### Significant Fauna

The only species of significant fauna actually recorded in the project area are the Great Egret (listed as migratory and seen on Wright Lake during waterbird surveys conducted by Birds Australia) and the Quenda (listed as Priority 4 and recorded during the site inspection). The Great Egret is probably a regular visitor to Wright Lake and seasonal wetlands near Southern River, while the Quenda is known to be widespread in the Armadale area (Perth's Bush Forever, Government of Western Australia 2000). The Quenda favours dense, low vegetation, whether native or introduced. It is probably most abundant around Wright Lake and in the vicinity of Southern River, but will occur wherever remnant vegetation or dense weeds provide cover in the cleared areas.

The presence of other significant fauna can only be predicted, but all species that may be present rely on Wright Lake, remnant native vegetation or Southern River.

### Impacts

Development plans allow for the retention of remnant native vegetation in the vicinity of Southern River and much of that around Wright Lake, with development concentrated in cleared areas but also taking in part of Wright Lake and altering some characteristics of the lake. For example, the lake would become permanent, would be deeper in parts, salinity would be reduced and islands (for wildlife habitats) are proposed. Boating would also take place on parts of the lake, with the suggestion that fish (species?) would be introduced to support recreational fishing. Parts of the

development would include habitat rehabilitation. Overall, impacts can therefore be summarised as follows:

- Developments in cleared areas will have minimal significant impact because such cleared habitat is widespread and cleared areas are of little importance for significant fauna. The only significant impact would be the loss of single large trees used for roosting and/or nesting by species of bats and birds.
- Rehabilitation has the potential to create additional habitat and to strengthen the linkage between Southern River and Wright Lake. The proposed canoe trail has the potential to support significant riparian vegetation of conservation value, but the rowing course, being broad and sharp-edged, may be of less value. The extent to which waterbirds would use the rowing course is difficult to determine, but it would probably be of low value for them. There is probably more potential benefit for wildlife from a canoe trail than from the rowing course. The canoe trail could be especially valuable if shallow side-branches and thickets of both low and tall riparian vegetation could be created.
- Changes to the Wright Lake environment will result in a complex of impacts, both beneficial and deleterious. Making Wright Lake deeper, permanent and with reduced salinity will alter vegetation and the aquatic invertebrate fauna, will probably benefit some waterbirds but may disadvantage other species. For example, migratory shorebirds may not visit the lake seasonally because of the absence of extensive shallows as it dries out in summer, although some seasonal shallows have been incorporated into the design. There may be considerable benefit to some other waterbirds, however, such as ducks, that may be able to use a permanent water body as a summer/autumn refuge when many lakes in the Perth area are dry.
- Increased boating activity on Wright Lake will increase levels of disturbance of waterbirds even with the construction of habitat islands.
- The introduction of a large fish species for angling purposes to the wetland could have great impact upon aquatic invertebrates, and at least one study has demonstrated a decline in waterbird breeding success due to competition between predatory fish and ducklings for invertebrates as food (Giles 1992). Even if a large fish species isn't introduced, making Wright Lake permanent will enable it to support the introduced Mosquitofish *Gambusia holbrooki*, which may adversely affect aquatic invertebrates and frogs in the wetland. Accidental introduction of this species is almost inevitable. Note that there is no native (to the South-West region) freshwater fish species suitable for angling, although the normally estuarine Black Bream *Acanthopagrus butcheri* can live in waters of low salinity. The Black Bream is predatory and can be expected to impact upon aquatic macro-invertebrates and tadpoles. There are some small freshwater fish that are native to the South-West that can be used to control mosquito larvae, and will coexist with the Mosquitofish if there is sufficient aquatic and emergent vegetation.
- Housing proposed close to Wright Lake may lead to increased numbers of domestic pets close to conservation areas. Dogs have caused problems for waterbirds through disturbance and predation in other parts of Perth, while there is always a concern with cats preying upon small birds and other wildlife. Especially in small reserves, such predation of sedentary species can lead to local extinction.
- Although not directly part of the proposed project, the construction of Tonkin Highway will create a barrier between Wright Lake and remnant native

vegetation (outside the project area) to the north. This separation of a wetland from a large area of upland vegetation is undesirable as there will almost certainly be movement of wildlife between the lake and the upland vegetation. The project area currently provides a weak link for wildlife between Southern River and the remnant vegetation north of Wright Lake.

### Management of Impacts

There is potential for beneficial impacts through the creation of habitat, particularly in that part of the project area that is currently cleared and badly degraded. Any rehabilitation/habitat creation that can be achieved between Southern River and Wright Lake will increase the linkage between these two areas and will therefore improve the ability of fauna to move between them. Habitat creation can include gardens and ornamental planting. Given that the main development area lies between two sites of conservation value, local, native plant species should be used wherever possible to enhance habitat values. Local, native plant species should definitely be used where rehabilitation for habitat creation is the goal, such as around Wright Lake and near Southern River.

Impacts associated with developments around Wright Lake may be difficult to manage and changes to the fauna will be inevitable. The existing plan does allow for water of different depths, seasonal shallows and the like, and will therefore favour some waterbird species, although the relative abundance of species will probably change. Impacts that can be managed are those associated with disturbance and the introduction of fish for recreational angling. It may be necessary to exclude access by boats to islands created for wildlife, for example, and to limit access to some sections of shorelines. The introduction of fish for recreational angling needs to be considered seriously.

As noted above, increased numbers of domestic pets may present problems close to Wright Lake. Dogs should only be allowed on leads around Wright Lake, while owners of cats should be encouraged to keep them in at night, and preferably at all times.

The proposal has the potential to improve linkage between Southern River and Wright Lake for fauna, and that will have a flow-on effect to the remnant woodland north of Wright Lake. Such linkage networks through the urban landscape are important for conservation and are discussed in Perth's Bush Forever (Government of Western Australia 2000). With the development of the Champion Lakes reserve, Tonkin Highway when constructed may act as a barrier for wildlife movement so there will be a need to incorporate wildlife underpasses adjacent to Wright Lake.

TABLE 1. Aquatic macro-invertebrates recorded in Wright Lake based on a net-sample taken on 5<sup>th</sup> October 1995 (L. Charlton pers. comm.)

CLASS	ORDER	FAMILY	SPECIES
ANNELIDA			Oligochaete sp. 1
MOLLUSCA		Physidae	Physa acuta
CRUSTACEA	Amphipoda	Ceinidae	Austrochiltonia subtenuis
	Cladocera	Daphniidae	Simnocephalus sp
		Moinidae	Moina tenuicornis
	Copepoda	Calanoida	Calanoid sp. 1
		Cyclopoida	Cyclopoid sp. 1
	Ostracoda	Cyprididae	Bennelongia australis
			Candonocypris novaezelandiae
			Cypretta sp. 1
ARACHNIDA	Hydracarina	Arrenuridae	Arrenurus balladoniensis
		Eylaidae	Eylais sp. 1
		Limnesiidae	Limnesia sp. 1
		Pionidae	Piona cumberlandensis
INSECTA	Coleoptera (LARVA)	Dytiscidae	Antiporus femoralis
			Copelatus sp. 1
			Dytiscid sp. 1
			Homeodytes scutellaris
		Hydrophilidae	Berosus sp.
			Hydrophilid sp. 1
			Hydrophilid sp. 2
	Coleoptera (ADULT)	Curculionidae	Curculionid sp. 1
		Dytiscidae	Dytiscid sp. 1
			Sternopriscus multimaculatus
		Haliplidae	Haliplid sp. 1
		Hydrophilidae	Hydrophilid sp. 1
			Hydrophilid sp. 2
	Diptera	Chironomidae	Ablabesmyia notabilis
			Corynoneura sp. 1
			Dicrotendipes conjunctus
			Paratrichocladius sp. 1
			Procladius villosimanus
			Tanytarsus fuscithorax
		Culicidae	Culex australicus
			Anopheles sp. 1
			Anopheles sp. 2
		Ephydriidae	Ephydrid sp. 1
		Stratiomyidae	Stratiomyid sp. 1
		Tabanidae	Tabanid sp. 1
	Hemiptera	Corixidae	Agraptocorixa eurynome
			Micronecta robusta
			Sigara sp. 1
		Notonectidae	Paranisops inconstans
	Odonata	Aeshnidae	Aeshna brevistyla
			Hemianax papuensis
		Coenagrionidae	Ischnura heterosticta
		Lestidae	Austrolestes analis
			Austrolestes annulosus
	Trichoptera	Leptoceridae	Triplectides australis

TABLE 2. Frog and reptile species known from the Swan Coastal Plain of the Perth region (south of the Swan River) and which are expected on the site. Species for which no suitable habitat is available, or that are extinct in the region, are not included. The significance columns indicate species of National Conservation Significance (NCS – listed under conservation acts and/or agreements) and those of Regional Conservation Significance (RCS – species with locally or regionally restricted distributions).

Species	NCS	RCS
<b>Myobatrachidae</b> (ground frogs)		
Quacking Frog		<i>Crinia georgiana</i>
Glauert's Froglet		<i>Crinia (Ranidella) glauerti</i>
Sandplain Froglet		<i>Crinia (Ranidella) insignifera</i>
Moaning Frog		<i>Heleioporus eyrei</i>
Pobblebonk		<i>Limnodynastes dorsalis</i>
Turtle Frog		<i>Myobatrachus gouldii</i>
Guenther's Toadlet		<i>Pseudophryne guentheri</i>
<b>Hylidae</b> (tree frogs)		
Slender Tree Frog		<i>Litoria adelaidensis</i>
Motorbike Frog		<i>Litoria moorei</i>
<b>Chelidae</b> (side-neck tortoises)		
South-West Long-necked Tortoise		<i>Chelodina oblonga</i>
<b>Gekkonidae</b> (geckoes)		
Southern Spiny-tailed Gecko		<i>Diplodactylus spinigerus</i>
Marbled Gecko		<i>Phyllodactylus marmoratus</i>
<b>Pygopodidae</b> (legless lizards)		
Sand-Plain Worm-Lizard		<i>Aprasia repens</i>
Fraser's Legless Lizard		<i>Delma fraseri</i>
Burton's Legless Lizard		<i>Lialis burtonis</i>
Common Scalefoot		<i>Pletholax gracilis</i>
		+
<b>Pygopus lepidopodus</b>		
<b>Agamidae</b> (dragon lizards)		
Western Bearded Dragon		<i>Pogona minor</i>
Sandhill or Heath Dragon		<i>Tympanocryptis adelaidensis</i>
		+
<b>Varanidae</b> (monitors or goannas)		
Gould's Sand Goanna		<i>Varanus gouldii</i>
Rosenberg's Goanna		<i>Varanus rosenbergi</i>
Black-headed Tree Goanna		<i>Varanus tristis</i>
		+
<b>Scincidae</b> (skink lizards)		
South-West Cool Skink		<i>Acritoscincus (Bassiana) trilineatum</i>
Fence Skink		<i>Cryptoblepharus plagiocephalus</i>
West Coast Ctenotus		<i>Ctenotus fallens</i>
		<i>Ctenotus impar</i>
Western Limestone Ctenotus		<i>Ctenotus australis (lesueurii)</i>
King's Skink		<i>Egernia kingii</i>
Mourning Skink		<i>Egernia luctuosa</i>
Salmon-bellied Skink		<i>Egernia napoleonis</i>
Two-toed Earless Skink		<i>Hemiergis quadrilineata</i>
West Coast Four-toed Lerista		<i>Lerista elegans</i>
Perth Lined Lerista		<i>Lerista lineata</i>
		+

Table 2 (cont.)

Species		NCS	RCS
Worm Lerista	<i>Lerista praepedita</i>		+
Dwarf Skink	<i>Menetia greyii</i>		
West Coast Morethia	<i>Morethia lineoocellata</i>		
Dusky Morethia	<i>Morethia obscura</i>		
Western Bluetongue	<i>Tiliqua occipitalis</i>		+
Bobtail	<i>Tiliqua rugosa</i>		
<b>Typhlopidae</b> (blind snakes)			
	<i>Ramphotyphlops australis</i>		
<b>Elapidae</b> (front-fanged snakes)			
Crowned Snake	<i>Drysdalia coronata</i>		+
Black-naped Snake	<i>Neelaps (Vermicella) bimaculatus</i>		
Black-striped Snake	<i>Neelaps (Vermicella) calonotus</i>	+	
Western Tiger Snake	<i>Notechis scutatus</i>		
Dugite	<i>Pseudonaja affinis</i>		
Gould's Snake	<i>Suta (Rhinoplocephalus) gouldii</i>		
Jan's Bandy-Bandy	<i>Simoselaps (Vermicella) bertholdi</i>		
Narrow-banded Snake	<i>Simoselaps (Vermicella) fasciolata</i>		
Half-ringed Snake	<i>Simoselaps (Vermicella) semifasciatus</i>		
Number of species observed or expected:			
Frogs:	9		
Reptiles:	39		

TABLE 3. Bird species known from the Swan Coastal Plain of the Perth region (south of the Swan River) and which are expected on the site. Species observed during the site inspection (+) or recorded during Birds Australia waterbird surveys on Wright Lake (1987-1992) are indicated in the records column, including maximum counts of waterbirds and breeding records (brd). The significance columns indicate species of National Conservation Significance (NCS – listed under conservation acts and/or agreements) and those of Regional Conservation Significance (RCS – species with locally or regionally restricted distributions). M indicates species listed as migratory under the EPBC Act. Introduced species (Int) are noted in the records column.

Species	Records	NCS	RCS
<b>Phasianidae</b> (pheasants and quails)			
Stubble Quail <i>Coturnix pectoralis</i>			
<b>Anatidae</b> (ducks, geese and swans)			
Musk Duck <i>Biziura lobata</i>	1		
Freckled Duck <i>Stictonetta naevosa</i>		+	
Black Swan <i>Cygnus atratus</i>	11		
Australian Shelduck <i>Tadorna tadornoides</i>	29 (brd)		
Pacific Black Duck <i>Anas superciliosus</i>	192 (brd)		
Grey Teal <i>Anas gibberifrons</i>	480 (brd)		
Australasian Shoveler <i>Anas rhynchotis</i>	6 (brd)		
Pink-eared Duck <i>Malacorhynchus membranaceus</i>	6		
Hardhead <i>Aythya australis</i>	1		
Australian Wood Duck <i>Chenonetta jubata</i>			
<b>Podicipedidae</b> (grebes)			
Australasian Grebe <i>Tachybaptus novaehollandiae</i>	8 (brd)		
Hoary-headed Grebe <i>Poliiocephalus poliocephalus</i>	6 (brd)		
<b>Ardeidae</b> (herons and egrets)			
White-faced Heron <i>Egretta novaehollandiae</i>	5		
White-necked Heron <i>Ardea pacifica</i>			
Great Egret <i>Ardea alba</i>	1	M	
Nankeen Night Heron <i>Nycticorax caledonicus</i>			
Little Bittern <i>Ixobrychus minutus</i>		+	
Australasian Bittern <i>Botaurus poiciloptilus</i>		+	
<b>Phalacrocoracidae</b> (cormorants)			
Little Pied Cormorant <i>Phalacrocorax melanoleucos</i>	8		
Little Black Cormorant <i>Phalacrocorax sulcirostris</i>			
<b>Pelecanidae</b> (pelicans)			
Australian Pelican <i>Pelecanus conspicillatus</i>			
<b>Plataleidae</b> (ibis and spoonbills)			
Glossy Ibis <i>Plegadis falcinellus</i>			
Australian White Ibis <i>Threskiornis molucca</i>	1		
Straw-necked Ibis <i>Threskiornis spinicollis</i>			
Yellow-billed Spoonbill <i>Platalea flavipes</i>			
<b>Accipitridae</b> (kites, hawks and eagles)			
Black-shouldered Kite <i>Elanus notatus</i>			
Square-tailed Kite <i>Lophoictinia isura</i>		+	
Whistling Kite <i>Haliastur sphenurus</i>			
Swamp Harrier <i>Circus approximans</i>		M	
Brown Goshawk <i>Accipiter fasciatus</i>			
Collared Sparrowhawk <i>Accipiter cirrhocephalus</i>			



Table 3 (cont.).

Species		Records	NCS	RCS
Wedge-tailed Eagle	<i>Aquila audax</i>	+		
Little Eagle	<i>Hieraaetus morphnoides</i>			
<b>Falconidae</b> (falcons)				
Peregrine Falcon	<i>Falco peregrinus</i>		+	
Australian Hobby	<i>Falco longipennis</i>			
Nankeen Kestrel	<i>Falco cenchroides</i>	+		
<b>Rallidae</b> (crakes and rails)				
Buff-banded Rail	<i>Gallirallus philippensis</i>			
Baillon's Crake	<i>Porzana pusilla</i>			
Australian Spotted Crake	<i>Porzana fluminea</i>			
Spotless Crake	<i>Porzana fusca</i>			
Purple Swamphen	<i>Porphyrio porphyrio</i>	2		
Eurasian Coot	<i>Fulica atra</i>	48 (brd)		
<b>Turnicidae</b> (button-quails)				
Painted Button-quail	<i>Turnix varia</i>			
<b>Scolopacidae</b> (sandpipers)				
Marsh Sandpiper	<i>Tringa stagnatilis</i>		M	
Common Greenshank	<i>Tringa nebularia</i>		M	
Common Sandpiper	<i>Tringa hypoleucos</i>		M	
Red-necked Stint	<i>Calidris ruficollis</i>		M	
Long-toed Stint	<i>Calidris subminuta</i>		M	
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		M	
<b>Charadriidae</b> (plovers and lapwings)				
Red-capped Plover	<i>Charadrius ruficapillus</i>	1		
Black-fronted Dotterel	<i>Elseyaornis melanops</i>	15		
Banded Lapwing	<i>Vanellus tricolor</i>			
<b>Laridae</b> (gulls and terns)				
Silver Gull	<i>Larus novaehollandiae</i>	2		
Whiskered Tern	<i>Chlidonias hybridus</i>			
<b>Columbidae</b> (pigeons and doves)				
Rock Dove (feral pigeon)	<i>Columba livia</i>	+ (Int)		
Spotted Turtle-Dove	<i>Streptopelia chinensis</i>	+ (Int)		
Laughing Turtle-Dove	<i>Streptopelia senegalensis</i>	+ (Int)		
Common Bronzewing	<i>Phaps chalcoptera</i>	+		
Crested Pigeon	<i>Ocyphaps lophotes</i>	+		
<b>Cacatuidae</b> (cockatoos)				
Short-billed Black-Cockatoo	<i>Calyptorhynchus latirostris</i>			
Corella	<i>Cacatua</i> spp.	(Int)		
Galah	<i>Cacatua roseicapilla</i>	+		
<b>Psittacidae</b> (lorikeets and parrots)				
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	(Int)		
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>			
Red-capped Parrot	<i>Purpureicephalus spurius</i>			
Australian Ringneck (twenty-eight)	<i>Barnardius zonarius</i>	+		
Elegant Parrot	<i>Neophema elegans</i>			
<b>Cuculidae</b> (cuckoos)				
Pallid Cuckoo	<i>Cuculus pallidus</i>			
Fan-tailed Cuckoo	<i>Cuculus pyrrhophanus</i>			
Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>			
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>			

Table 3 (cont.)

Species	Records	NCS	RCS
<b>Strigidae</b> (hawk-owls)			
Barking Owl <i>Ninox connivens</i>		+	
Southern Boobook Owl <i>Ninox novaeseelandiae</i>			
<b>Tytonidae</b> (barn owls)			
Barn Owl <i>Tyto alba</i>			
<b>Podargidae</b> (frogmouths)			
Tawny Frogmouth <i>Podargus strigoides</i>			
<b>Apodidae</b> (swifts)			
Fork-tailed Swift <i>Apus pacificus</i>			
<b>Halcyonidae</b> (forest kingfishers)			
Laughing Kookaburra <i>Dacelo novaeguineae</i>	(Int)		
Sacred Kingfisher <i>Todiramphus sanctus</i>			
<b>Meropidae</b> (bee-eaters)			
Rainbow Bee-eater <i>Merops ornatus</i>			
<b>Maluridae</b> (fairy-wrens)			
Splendid Fairy-wren <i>Malurus splendens</i>	+		
<b>Pardalotidae</b> (pardalotes)			
Spotted Pardalote <i>Pardalotus punctatus</i>			
Striated Pardalote <i>Pardalotus striatus</i>			
White-browed Scrubwren <i>Sericornis frontalis</i>			
Weebill <i>Smicromnis brevirostris</i>			
Western Gerygone <i>Gerygone fusca</i>			
Inland Thornbill <i>Acanthiza apicalis</i>	+		
Western Thornbill <i>Acanthiza inornata</i>			
Yellow-rumped Thornbill <i>Acanthiza chrysorrhoa</i>	+		
<b>Meliphagidae</b> (honeyeaters)			
Red Wattlebird <i>Anthochaera carunculata</i>	+		
Western Wattlebird <i>Anthochaera lunulata</i>			
Yellow-throated Miner <i>Manorina flavigula</i>			
Singing Honeyeater <i>Lichenostomus virescens</i>			
Brown Honeyeater <i>Lichmera indistincta</i>	+		
New Holland Honeyeater <i>Phylidonyris novaehollandiae</i>			
White-cheeked Honeyeater <i>Phylidonyris nigra</i>			
Tawny-crowned Honeyeater <i>Phylidonyris melanops</i>			
Western Spinebill <i>Acanthorhynchus superciliosus</i>			
<b>Petroicidae</b> (Australian robins)			
Hooded Robin <i>Melanodryas cucullata</i>			+
Scarlet Robin <i>Petroica multicolor</i>			
<b>Neosittidae</b> (sittellas)			
Varied Sittella <i>Daphoenositta chrysoptera</i>			
<b>Pachycephalidae</b> (whistlers)			
Rufous Whistler <i>Pachycephala rufiventris</i>			
Golden Whistler <i>Pachycephala pectoralis</i>			+
Grey Shrike-thrush <i>Colluricincla harmonica</i>			
<b>Dicruridae</b> (flycatchers)			
Magpie-lark <i>Grallina cyanoleuca</i>	+		
Grey Fantail <i>Rhipidura fuliginosa</i>	+		
Willie Wagtail <i>Rhipidura leucophrys</i>	+		
<b>Campephagidae</b> (cuckoo-shrikes)			
Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>	+		
White-winged Triller <i>Lalage sueurii</i>			

Table 3 (cont.)

Species		Records	NCS	RCS
<b>Artamidae</b> (woodswallows)				
Black-faced Woodswallow	<i>Artamus cinereus</i>	+		
Grey Butcherbird	<i>Cracticus torquatus</i>	+		
Australian Magpie	<i>Gymnorhina tibicen</i>	+		
<b>Corvidae</b> (ravens and crows)				
Australian Raven	<i>Corvus coronoides</i>	+		
<b>Motacillidae</b> (pipits and true wagtails)				
Richard's Pipit	<i>Anthus novaeseelandiae</i>	+		
<b>Dicaeidae</b> (flower-peckers)				
Mistletoebird	<i>Dicaeum hirundinaceum</i>			
<b>Hirundinidae</b> (swallows)				
White-backed Swallow	<i>Cheramoeca leucosternus</i>			
Welcome Swallow	<i>Hirundo neoxena</i>			
Tree Martin	<i>Hirundo nigricans</i>			
<b>Sylviidae</b> (Old World warblers)				
Clamorous Reed-Warbler	<i>Acrocephalus stentoreus</i>			
Little Grassbird	<i>Megalurus gramineus</i>			
<b>Zosteropidae</b> (white-eyes)				
Silvereye	<i>Zosterops lateralis</i>			
Number of species	observed:	42		
	observed or expected:	122		
	Regional Conservation Significance:	2		
	National Conservation Significance:	13		

TABLE 4. Mammal species known from the Swan Coastal Plain of the Perth region and which are expected on the site. Species observed during the site inspection are indicated (+) in the Records column. The significance columns indicate species of National Conservation Significance (NCS – listed under conservation acts and/or agreements) and those of Regional Conservation Significance (RCS – species with locally or regionally restricted distributions). Introduced species (Int) are noted in the Records column.

Species	Records	NCS	RCS
<b>Tachyglossidae</b> (echidnas)			
Echidna <i>Tachyglossus aculeatus</i>			
<b>Peramelidae</b> (bandicoots)			
Quenda or Southern Brown Bandicoot <i>Isoodon obesulus</i>	+	+	
<b>Tarsipedidae</b> (honey possum)			
Honey Possum <i>Tarsipes rostratus</i>			+
<b>Phalangeridae</b> (possums)			
Brush-tailed Possum <i>Trichosurus vulpecula</i>			
<b>Macropodidae</b> (kangaroos and wallabies)			
Western Grey Kangaroo <i>Macropus fuliginosus</i>			
<b>Mollosidae</b> (mastiff bats)			
White-striped Bat <i>Nyctinemus (Tadarida) australis</i>	+		
<b>Vespertilionidae</b> (vesper bats)			
Gould's Wattled Bat <i>Chalinolobus gouldii</i>	+		
Chocolate Wattled Bat <i>Chalinolobus morio</i>			
<i>Falsistrellus mackenziei</i>		+	
<i>Vespedalus (Eptesicus) regulus</i>			
Lesser Long-eared Bat <i>Nyctophilus geoffroyi</i>	?+		
Gould's Long-eared Bat <i>Nyctophilus gouldii</i>			
Greater Long-eared Bat <i>Nyctophilus major (timoriensis)</i>	?+		
<b>Muridae</b> (rats and mice)			
Rakali or Water-Rat <i>Hydromys chrysogaster</i>		+	
House Mouse <i>Mus musculus</i>			
Black Rat <i>Rattus rattus</i>			
<b>Leporidae</b> (rabbits and hares)			
Rabbit <i>Oryctolagus cuniculus</i>	+ Int		
<b>Canidae</b> (foxes and dogs)			
European Red Fox <i>Vulpes vulpes</i>	+ Int		
<b>Felidae</b> (cats)			
Feral Cat <i>Felis catus</i>	+ Int		
Number of species	observed or expected: introduced:	19 5	

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**APPENDIX ONE.** Categories used in the assessment of conservation status.

**Environmental Protection and Biodiversity Conservation Act and the WA Wildlife Conservation Act** (categories mainly from IUCN, based on review by Mace and Stuart 1994).

Extinct. Taxa not definitely located in the wild during the past 50 years.

Extinct in the Wild. Taxa known to survive only in captivity.

Critically Endangered. Taxa facing an extremely high risk of extinction in the wild in the immediate future.

Endangered. Taxa facing a very high risk of extinction in the wild in the near future.

Vulnerable. Taxa facing a high risk of extinction in the wild in the medium-term future.

Near Threatened. Taxa that risk becoming Vulnerable in the wild.

Conservation Dependent. Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.

Other Specially Protected Fauna (WA Act only).

Data Deficient (Insufficiently Known). Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.

Least Concern. Taxa that are not Threatened.

**WA Department of Conservation and Land Management Priority species** (species not listed under the Conservation Act, but for which there is some concern).

Priority 1. Taxa with few, poorly known populations on threatened lands.

Priority 2. Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.

Priority 3. Taxa with several, poorly known populations, some on conservation lands.

Priority 4. Taxa in need of monitoring.



# **Report on Survey of Wright Lake on 11 September 2002**

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Bamford CONSULTING ECOLOGISTS  
03/02/'03

## **Introduction**

This report is intended as a supplement to a previous report (Bamford & Bamford 2002). The Champion Lakes project is a recreational park in the City of Armadale incorporating land and water based activities. It takes in Wright Lake and extends south-west to the Southern River. The proposal includes a golf course, equestrian facilities, sporting stadiums, playing fields, a cable ski park, a canoeing trail and possibly a rowing course, a residential area and some land set aside for conservation. It also includes modification of Wright Lake.

The initial site inspection was carried out on the 6<sup>th</sup> and 7<sup>th</sup> of March 2002, when Wright Lake was dry. This additional site inspection was carried out when there was water in the lake.

## **Methods**

Wright Lake was visited on the morning of 11 September 2002, by J. Wilcox and R. Davis, for Bamford Consulting Ecologists. The purpose of the visit was to identify the waterbirds present, and to sample the aquatic macro-invertebrates.

### Waterbirds

All the waterbirds on the lake were counted, and any breeding activity was noted.

### Aquatic Macro-invertebrates

The aquatic macro-invertebrates were sampled using a 15 x 20cm sweep net. Each sample consisted of a 5m sweep through the water column, just above the benthos. Five samples were taken each from the open water of the lake and from the vegetated lake margins. A specimen of each macro-invertebrate captured was preserved in alcohol and sent to the Murdoch University Freshwater Ecology group to be identified. The identifications were carried out by Karin Strehlow of Murdoch University.

## **Results**

### Waterbirds

Only seven species of waterbird were recorded during the September visit to Wright Lake (Table 1). A full list of the 122 species expected to regularly use the wetland are indicated in the previous report (Bamford & Bamford 2002). Only the Pacific Black Duck was recorded breeding, with two broods of young chicks present. The other species were either roosting or foraging along the lake margins. Compared with past records, the number of waterbirds present was low, but that is to be expected in

September when many wetlands in the region contain water and waterbirds are therefore widely dispersed.

### Aquatic Macro-invertebrates

Twenty taxa were identified from the samples sent to Murdoch University (Table 2). The waterflea *Daphnia carinata* was the most common invertebrate in the open water. In large numbers, this species can indicate eutrophication in the lake. Seed shrimps (Ostracoda) were present in reasonable numbers in both habitats, and both Mosquitoes (Culicidae) and midges (Chironomidae) were present only in low numbers. Other taxa identified included beetles (Coleoptera), bugs (Hemiptera), dragonflies (Zygoptera), damselflies (Anisoptera) and flies (Diptera).

As noted in the previous report (Bamford & Bamford 2002), the composition of the lake's invertebrate fauna changes with seasonal changes in salinity. Species associated with freshwater are abundant when salinity levels are low, but species associated with saline water replace these as water levels fall and salinity increases. Therefore, only some of the invertebrate species would have been sampled in September, and these were mainly freshwater species as the water level was still quite high.

The regional significance of the invertebrates recorded in Wright Lake was assessed with reference to the distribution of taxa documented by Davis and Christidis (1997) in surveys of over 40 wetlands in the Perth area. The majority of taxa recorded in Wright Lake were widespread with the only exceptions as follows:

Cladocera    Ilyocypridae    A very small crustacean that could not be identified to species. One member of this family, *Ilyocypris australiensis*, documented by Davis and Christidis (1997) only from the Ellen Brook Floodplain. Noted as "usually found in temporary pools which have very soft substrates and turbid waters".

Anisoptera    Gomphidae    A dragonfly *Austrogomphus* sp. was collected in small numbers but is not listed by Davis and Christidis (1997). The genus is described as widespread in Australia by O'Farrell (1979). Ms Karin Strehlow and Dr Jenny Davis at Murdoch University confirmed that the species is also widespread in the Perth area, but is rarely collected because the nymph burrows in the substrate.

Coleoptera    Noteridae    A larva that could not be identified to species. Davis and Christidis (1997) list one noterid species, *Hydrocoptus subfasciatus*, from Forrestdale Lake.

### Frogs

Although frogs were not deliberately sampled, tadpoles of the genus *Crinia* were identified in 4 out of 5 invertebrate sweeps in the vegetated margins of the lake, with 21 tadpoles counted across 5 sweeps.

**Table 1. Birds recorded at Wright Lake on 11/09/02. Breeding species are indicated by (brd).**

Species	Records
<b>Anatidae</b> (ducks, geese and swans)	
Black Swan <i>Cygnus atratus</i>	2
Australian Shelduck <i>Tadorna tadornoides</i>	4
Pacific Black Duck <i>Anas superciliosus</i>	21(brd)
Grey Teal <i>Anas gibberifrons</i>	2
<b>Ardeidae</b> (herons and egrets)	
White-faced Heron <i>Egretta novaehollandiae</i>	1
White-necked Heron <i>Ardea pacifica</i>	1
<b>Plataleidae</b> (ibis and spoonbills)	
Australian White Ibis <i>Threskiornis molucca</i>	3

**Table 2. Relative abundance of macro-invertebrate taxa recorded from Wright Lake on 11/09/02. The relative abundance of each taxa is indicated for the open water sweeps and the sweeps in the vegetated margins of the lake.**

+ 1 - 10  
 ++ 11 - 100  
 +++ 101 - 1000  
 ++++ 1001 or more

Class/Order	Family	Name	Relative abundance	
			Open water	Veg. margins
Ostracoda	Cyprididae	<i>Mytilocypris ambigua</i> De Deckker	+	++
Ostracoda	Cyprididae	<i>Bennelongia australis</i> (Brady)	++	++
Ostracoda	Cyprididae	<i>Sarcypridopsis aculeata</i> (Costa)	+	+
Cladocera	Daphniidae	<i>Daphnia carinata</i>	++++	++
Cladocera	Ilyocryptidae			++
Hemiptera	Notonectidae	<i>Notonecta sp.</i>	++	++
Hemiptera	Corixidae	juv.	+	+
Hemiptera	Corixidae	<i>Micronecta sp. juv.</i>	+	+
Anisoptera	Gomphidae	<i>Austrogomphus sp.</i>		+
Zygoptera	Lestidae	<i>Austrolestes annulosus</i> (Selys)	+	++
Coleoptera	Dytiscidae	<i>Hyderodes</i> larvae	+	
Coleoptera	Dytiscidae	<i>Megaporus sp.</i>	+	+
Coleoptera	Dytiscidae	<i>Lancites lanceolatus</i>	+	+
Coleoptera	Noteridae			+
Coleoptera	Hydrophilidae	<i>Berosus sp.</i>		+
Coleoptera	Hydrophilidae	<i>Berosus sp. larvae</i>		+
Diptera	Stratiomyidae	larvae		+
Diptera	Chironomidae	<i>Tanytarsus fuscithorax</i> (Skuse)		+
Diptera	Culicidae	<i>Culex sp.</i>	+	+
Arachnida	Eylidae	<i>Eylais sp.</i>	+	
Gastropoda	Physidae	<i>Physa sp.</i>	+	+

## References

- Bamford, M.J. & A.R., CONSULTING ECOLOGISTS (2000). Champion Lakes Master Plan; Fauna. Unpublished report prepared for Bowman Bishaw Gorham, Perth.
- O'Farrell, A.F. (1979). Odonata. Pp. 241-261 in The Insects of Australia, CSIRO Division of Entomology, Canberra.