

## SUMMARY

### BACKGROUND

Clearing practices in Australia have reduced the area of native habitat available to fauna. Transport corridor infrastructure has not only played a part in the clearing of land, but also in habitat fragmentation. As a consequence of these actions, it is becoming increasingly important that we design and manage transport corridors so as to reduce the impact on Australia's native fauna species.

Research to date has confirmed that transport infrastructure (and in particular roads) has both direct and indirect impacts on fauna. Direct impacts such as road mortalities can be significant for fauna populations with low numbers or widely dispersed individuals. In addition, indirect impacts from barriers to fauna movement, such as fences or embankments, and edge effects, created by vegetation clearing, are known to reduce movement and thus reduce breeding opportunities for many species.

The increasing recognition of these impacts has led to the trialling and implementation of measures (or modifications) to improve road design. Measures vary from the installation of structures designed specifically to facilitate or guide fauna movement, to signs intended to increase the awareness of motorists. The installation of many measures in the past was largely driven by perceptions of what structures animals would use. In many cases, post-construction monitoring, or the appropriate maintenance of such structures, was not undertaken, and many structures have now been found to be ineffective. The monitoring of existing structures has increased over recent years, and a better understanding of their utility is being developed.

### IMPORTANCE OF THIS DOCUMENT

The Queensland Department of Main Roads has recognised the importance of planning, designing, constructing and maintaining roads in an ecologically sensitive manner. Although there is a large body of work about transport infrastructure effects on fauna, this information has not been compiled into a form that would help practitioners identify the most appropriate and effective measures to adopt.

This volume, 'Fauna Sensitive Road Design—Past and Existing Practices', is the first in a two-volume series, and is intended to provide an overview of existing knowledge relating to the impact of transport infrastructure on fauna, in addition to discussing the methods available to reduce these impacts. It is intended that the second volume, 'Fauna Sensitive Road Design—Preferred Practices', will provide a compilation of trials currently being undertaken by Main Roads and other State and international road management agencies. This latter volume will identify which measures are appropriate for facilitating

the safe movement of fauna. For the purposes of these two volumes, fauna has been divided into fauna groups (e.g. small ground dwelling mammals, large ground dwelling mammals, birds, reptiles, etc).

## COMPILATION OF DATA WITHIN THIS VOLUME

This volume discusses the potential impacts of transport infrastructure on fauna. It includes a brief theoretical background to animal behaviour and the function of vegetated corridors so as to help the reader understand the challenges faced when designing infrastructure that is to accommodate fauna movement. Also included in this volume is a review of practices used in road designs to facilitate fauna movement.

Two field studies in particular are analysed, and the general trends in effective designs and modifications noted in these studies are discussed. The studies mainly examine drainage structures and the use of these structures by fauna. A general indication of which culvert type facilitates effective movement for each fauna group is provided (see Table 1). It is, however, important to recognise that the data presented in Table 1 is preliminary only, and this data will be consolidated following further studies currently being undertaken and envisaged for inclusion in Volume 2 of this series.

**Table 1 Confirmed use of culvert or underpass type by fauna (+ indicates known use, - indicates not known or unconfirmed use)**

Fauna type	Small pipe <0.5 m diameter	Large pipe >0.5 m diameter	Small box culvert <1.2 m high	Large box culvert >1.2 m high	Bridge underpass
Small mammal	+	+	+	+	+
Medium mammal	+	+	+	-	+
Large mammal	-	+	-	+	+
Semi-arboreal mammal <sup>1</sup>	-	-	-	+*	+*
Arboreal mammal <sup>2</sup>	-	-	-	-	-
Microchiropteran bats <sup>3</sup>	-	-	-	+	+
Reptile	-	+	-	+	+
Bird	+	-	-	+	+
Amphibian	+	-	+	+	+
Introduced predator	+	+	+	+	+

\* The only semi-arboreal mammals recorded in fauna tunnels are the Koala and Eastern Pygmy Possum. These species are not considered to be exclusively arboreal.

1 Semi-arboreal mammal is one that spends the majority of time in trees but is also known to travel on the ground (e.g the Koala).

2 Arboreal mammals are tree-dwelling mammals (e.g. the Sugar Glider).

3 Microchiropteran bats are the small, insect-eating bats.

A synopsis of successful measures that facilitate fauna movement is included in Chapter 8 of Volume 1. Key findings include:

- Culverts of a size appropriate for the safe passage of numerous fauna types, rather than just one or a few fauna types, should be installed.
- The provision of dry passage within underpasses or culverts is preferable. Multiple cell culverts with the outer cells raised, or raised ledges within a culvert, will greatly assist fauna movement.
- Revegetation using locally indigenous plant species is suggested for the entrances of culverts. This provides an extension of habitat nearer to culvert entrances and thus provides shelter for fauna entering and exiting culverts.
- Wildlife fencing associated with culverts has proven to be effective in guiding animals into culverts and reducing road deaths. Fences installed on one side of the road only have not been found to reduce fauna road-kills.
- Ongoing maintenance of fences is essential to maintain their effectiveness. In particular, Koala-proof fences (unlike wildlife fences) require maintenance so that trees do not grow within 3 m of the fence. This ensures that Koalas do not climb the trees and jump the fence.

## **FUTURE RESEARCH**

The final section of this volume identifies those areas that require research so that we may further our knowledge regarding roads and fauna. It is envisaged that the research areas listed in Chapter 8 will be targeted by road management agencies throughout Australia, and the findings of these subsequent studies be compiled into volume two of this series. Key areas for future research include:

- The use and design of canopy bridges for arboreal species.
- The effectiveness of Swareflex wildlife reflectors for nocturnal species (particularly macropods).
- The appropriate design and location of wildlife fencing.
- The most effective location of culverts and the use of these structures by native fauna and introduced predators.