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magazine

SPRING 2002

\$8.25 GST Included



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# Under and

## Under

### The road problem

**ROADS AND THEIR VERGES** pose a greater problem to ground-dwelling rainforest wildlife than to similar species of many other habitats. Conditions on the road surface are completely different to that of the dark, cool, moist forest floor in terms of light intensity, temperature, humidity and vegetation complexity. This profound contrast, together with traffic disturbance, can result in the road and its verges forming a partial or complete barrier to crossings by some rainforest species. Other species attempt to cross but may be killed. Road mortality is considered a threat to several rainforest species in the Wet Tropics including the rare Lumholtz's Tree-kangaroo (*Dendrolagus lumholtzi*) and endangered Southern Cassowary (*Casuarius casuarius johnsonii*).

Underpasses that animals can use to cross a road without having to negotiate traffic are relatively common in Europe and North America and have been tried in open forest and pasture habitats in several Australian states. Monitoring of their effectiveness is less common, nevertheless a variety of mammals, birds, lizards and frogs have been observed inside them in recent years. However, little is known about effectiveness of underpasses for rainforest wildlife, although several years ago, we observed a number of rainforest rodents, echidna and goannas using culverts to cross a highway. Similarly, a Cassowary is known to regularly use a very large creek culvert to cross a highway, while a Lumholtz's Tree-kangaroo has been seen inside a disused railway tunnel.

On the Atherton Tablelands in far north Queensland, one of the areas considered a hotspot for road kills of Lumholtz's Tree-kangaroo is the East Evelyn road. The road divides two important areas of upland rainforest. These areas of rainforest are habitat for several rare wildlife species, including the Southern Cassowary, Lumholtz's Tree-kangaroo and the rainforest ringtail possums (see Over below). The Queensland Department of Main Roads decided a major road upgrade was necessary to widen and straighten the road and eliminate

hairpin bends. The road works were completed in December 2001. The road itself mainly traverses a narrow strip of weedy pasture separating the two rainforest blocks. The road upgrade incorporated four underpasses, three of which are for faunal use only. The other allows safe passage for the farmer!

Underpass siting, design and interiors were the best that a united group of highway engineers, researchers from the Cooperative Research Centre for Tropical Rainforest Ecology and Management, rainforest managers and the conservation community (Tree Kangaroo and Mammal Group) could imagine for the money that was available from the Department of Main Roads. The underpasses are large (3.4 m high and 3.7 m wide) to allow animals as tall as a Cassowary (1.5 metres) to move easily, and to ensure that animals at one entrance can see attractive habitat at the other end. The Queensland Parks and Wildlife Service Centre for Tropical Restoration and the community group Trees for the Evelyn and Atherton Tablelands (or TREAT) were involved with choice and establishment of food and cover plants to attract the target animals towards the entrances of the underpasses. This revegetation will create a narrow rainforest corridor that includes the underpasses through the abandoned pasture from one block of rainforest to the other. Before establishment of this corridor, small rainforest mammals did not cross the abandoned pasture and road. Therefore, populations from the two rainforest areas were separated from each other and probably unable to interbreed. Many underpass projects include fencing to prevent animals from crossing the road while funnelling them towards underpasses. However, it was decided that fencing would not be included in this project as it would increase fragmentation by the road of non-target, common fauna. Exclusion fencing may be considered in the future, but only if target fauna are killed after growth of the rainforest plants that encourage use of the underpasses.



# Over

Shaneen Murray, www.wildlife.com.au

Roads have a variety of negative impacts on wildlife — road kills are an obvious and tragic result of vehicle/wildlife interactions where animal habitats have been fragmented by roads. There is also concern about the less obvious effects of roads on rare species that seldom or never cross the road because they avoid disturbance or do not readily move at ground level. RAINFOREST CRC researchers in the Wet Tropics region of north Queensland are currently investigating solutions to these problems. Miriam Goosem and Nigel Weston report.

## Underpass interiors

One problem that must be considered when designing underpasses for fauna is the potential for predators, particularly feral animals such as dogs and cats, to focus their hunting activities at underpasses. Rainforest areas suffer this problem less than open habitats, as most feral predators are less likely to enter rainforest. However, feral cats and dogs are present along rainforest edges and are common in pasturelands of the Atherton Tablelands. Therefore, inside the wildlife underpasses at East Evelyn, escape poles in the form of large tree branches have been mounted vertically from the base of the underpass. These will allow climbing animals such as Tree-kangaroos to escape from feral predators. Dog attacks are recognised as a threat to Tree-kangaroos.

The bases of the underpasses have been covered in soil and leaf litter to simulate the forest floor. Logs and rocks were also placed inside the underpasses to provide cover for small, ground-dwelling rainforest animals. For tree-dwelling species, ropes have been swung from the underpass ceilings to the closest trees. Eventually, it is hoped to convert these ropes to rope ladders (see 'Over' below). As the rainforest trees next to the underpass entrances grow, so will the potential for tree-dwelling species to use the ropes or rope ladders.

## Underpass effectiveness

Wildlife use of the underpasses will be monitored for the next three years. Areas of sand placed centrally across the underpass floors have been used to examine tracks of animals using the structures. At present, we know that rainforest mammals including the Coppery Brushtail Possum (*Trichosurus vulpecula johnstonii*), bandicoots, rodents, and Red-legged Pademelon (*Thylogale stigmatica*) have traversed the sand. Additionally, birds including Buff-banded Rail, Brush Turkey, Lewin's Honeyeater and Crimson Rosella have been seen running or flying inside the underpasses and a Boobook Owl roosted there for several weeks. Occasional tracks of both cats and dogs have also been recorded. We do not expect to record the rare target species for many months until the rainforest corridor is well established.

We are continuing to monitor road kills in the vicinity of the underpasses and compare them with those on a rainforest road several kilometres away. Road kills in the vicinity of the fauna underpasses have been rare, although one Tree-kangaroo was recently killed nearby. It was thought that the presence of a steep embankment on the new road did not allow the animal to escape. This underlines the importance of a variety of considerations in road mortality. It appears that steep embankments without terracing can trap animals on the road surface. We hope that adjustment of some of the embankments along the new road away from the underpasses will include planted terraces that will provide an escape route for trapped animals. Once the trees have grown, the newly planted corridors leading to the underpasses should, in theory, create a far more attractive crossing route.

## Implications for Conservation

Although underpasses may help to mitigate some problems with roads, the best option is for new roads to avoid natural habitat as much as possible. However, where this is impossible, uniting engineers, ecologists and the conservation community early in the design phase to achieve a common conservation goal increases the likelihood of a successful project. The underpasses are currently in use by a variety of common rainforest species and road kill numbers are low. Whether they will be used by the rare and endangered species remains to be seen over the next few years. We hope that their success will result in similar or improved designs being included in other major road upgrades necessary in the Wet Tropics region in the future.



# Over

## Species at risk

Canopy bridges are not a new concept, and have been used to assist the mobility of tree-dwelling animals in at least seven countries in Europe, Africa, and North and South America. In Australia, trials have been undertaken in the Sydney region and are set to start in Tasmania. In all of these cases, the target species are those which commonly end up as road kill. However, as reported in the Summer 2000/2001 edition of *WILDLIFE Australia*, the tree-dwellers with most to gain from such structures in the Wet Tropics are probably the endemic rainforest ringtail possums. These species very rarely figure in road kill statistics. Rather, habitat fragmentation, including that caused by roads, poses a very real threat to their long-term survival.

Cleared land around forest fragments can constitute a barrier to the introduction of new genes, which then leads to inbreeding and eventual extinction of isolated populations. The fact that canopy-loving species such as the rare Lemuroid Ringtail (*Hemibelideus lemuroides*) hardly ever venture onto the ground means that even roads and powerline clearings can pose this kind of threat. Global warming is likely to exacerbate this problem as these species are restricted to montane forests within the Wet Tropics region that will contract in area if temperatures rise.

## The first bridge

In 1995, Rupert Russell, a well-known local conservationist, installed the first canopy bridge in the Wet Tropics over a disused logging track in rainforest near Lake Tinaroo, with the aid of the Far North Queensland Electricity Board and the Wet Tropics Management Authority. The bridge remains in place today, but was unmonitored until early 2000 when we began work on our study. By mid-2000, we had evidence of Lemuroid, Herbert River and Green Ringtails, Striped and Long-tailed Pygmy Possums and *Melomys* (a native rat) having been on the bridge.

## Time to modify

The design of the initial bridge was like a rope tunnel, to offer some protection from aerial predators. However, it was found that the rare target species preferred using the top of the structure to cross the road. Consequently, modified bridges were erected at two additional sites on the Atherton Tablelands. These new bridges were simplified to resemble simple rope ladders, a design that greatly decreased the costs of both construction and maintenance. This also reduces the liability concerns of the Main Roads Department, an important consideration in a region regularly visited by strong winds and inquisitive tourists.



## Gaps that need bridging most

The two new sites were very different. The first re-designed bridge was installed in December 2000 in a well-forested area near Millaa Millaa. This site was surrounded by many natural connections between trees across the road and there was already a good deal of animal movement through this canopy before the bridge went in. Little activity was observed on this bridge over the following months.

The second site was over a gazetted road — the Old Palmerston Highway, where no natural connections occurred resulting in little or no animal movement across the road via the canopy. At 15 metres, this bridge was twice the length of the original bridge installed by Rupert. It took little time to find conclusive evidence that the new bridge was being used on a regular basis by Lemuroid and Herbert River Ringtails, as well as the more common Coppery Brushtail Possum. It was even possible to film a Herbert River Ringtail making the crossing (see photo).

## Implications for conservation

Clearly, there is no need for canopy bridges over roads which retain good canopy connections and this is the best option for the animals. There is, however, good cause for their installation where there is no natural connection between trees allowing arboreal animals to cross a road or other linear clearing. In the UK, for example, they are a relatively common sight in the landscape where the native Red Squirrel is still abundant. There may be an equally strong case for their incorporation into roads construction policy in the Wet Tropics to facilitate movement of canopy-loving species as well as reduce the road toll for more common species such as the Brushtail — which happily move along the ground.





Images: Rainforest CRC



**left:** The bases of the underpasses are covered in soil and leaf litter to simulate the forest floor.

**above right:** Important areas of upland rainforest near the Atherton Tableland are habitat for several rare wildlife species, including the Southern Cassowary.

**right:** A Herbert River Ringtail Possum makes a dash across a 15 metre rope bridge that passes over the Old Palmerston Highway.



## Further Reading:

**Climate Action Network Australia** 2002, *Warnings From the Bush. The Impact of Climate Change on the Nature of Australia*. Available on-line at: [www.climateaustralia.org/bush/](http://www.climateaustralia.org/bush/)

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**Queensland Department of Main Roads** 1998, *Roads in the Wet Tropics: Planning, Design, Construction, Maintenance and Operation, Best Practice Manual*, Technology and Environment Division, Brisbane.

**Weston, N.** 2000, *Bridging the rainforest gap*, *Wildlife Australia* 37(4):16-19.

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