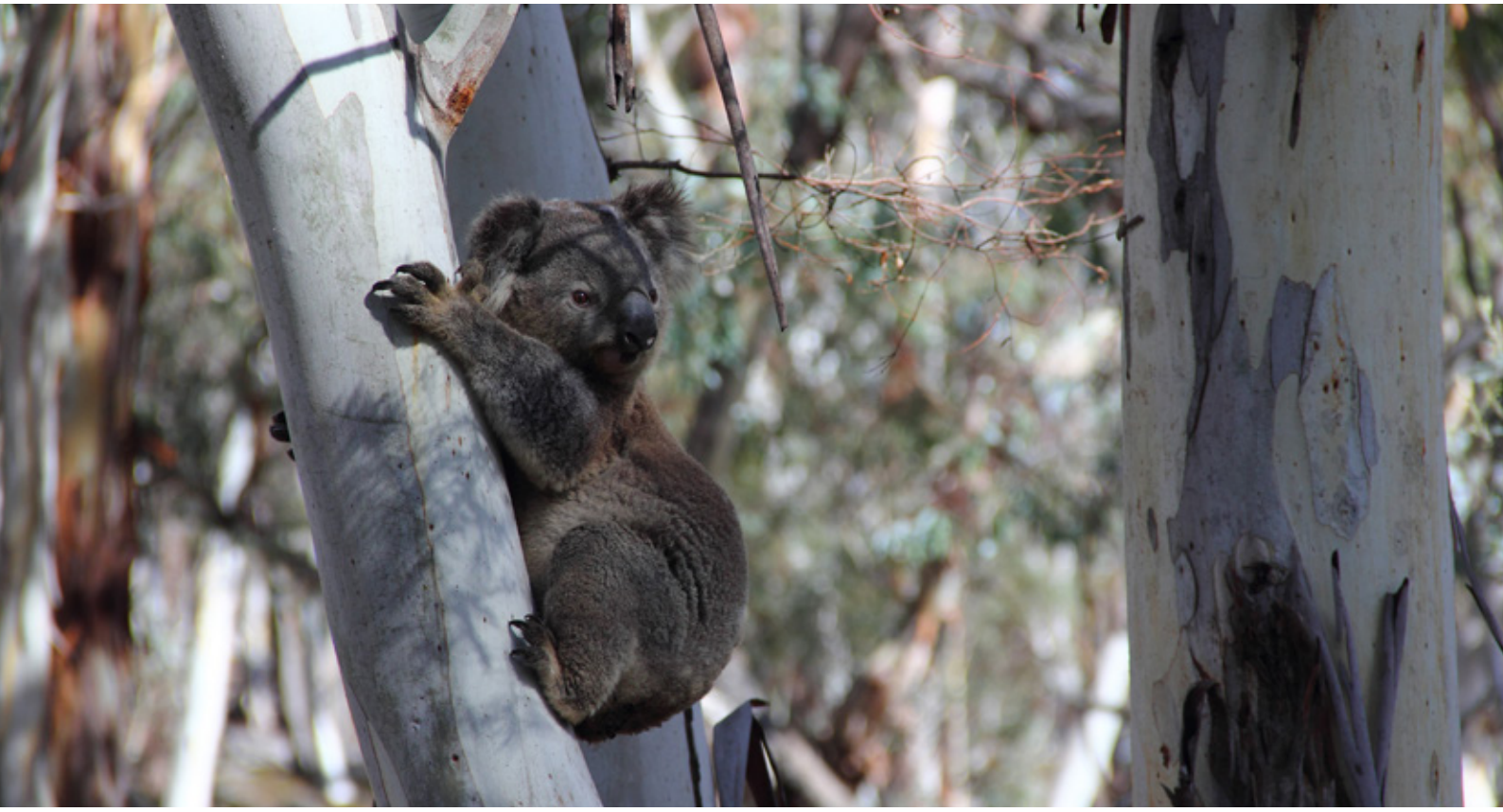
How to keep koalas off the road

Koala Vehicle Strike Fact sheet 2



Roads, cars and koala vehicle strike

Wildlife vehicle strike has a major impact on wildlife populations worldwide. In New South Wales (NSW), wildlife vehicle strike is regarded as a key threat to koalas (*Phascolarctos cinereus*).

Approaches to reduce wildlife vehicle strike include keeping wildlife off the road and changing driver behaviour. This fact sheet provides information about how to prevent koalas getting onto roads. It is one in a series of four fact sheets about koala vehicle strike that include:

- Fact sheet 1: Wildlife vehicle strike and contributing factors
- Fact sheet 3: How to change driver behaviour
- Fact sheet 4: How to record koala vehicle strike and monitor mitigation efforts.

Hard and virtual structures

Strategies to keep koalas from accessing roads fall into two broad categories:

1. Hard structures – structures built into the road corridor such as wildlife fencing, koala grids and crossing structures, as well as escape ramps/humps/poles and drop-downs used with fencing.
2. Virtual structures and devices – deterrent devices and technologies that aim to stop koalas and other wildlife moving onto roads or encourage them to move off a road when a vehicle approaches. This includes audio deterrents, roadside reflectors and emerging technology such as virtual fences.

Due to the difficulty and expense of installing hard structures, they are usually installed at the time of road construction or upgrade.

Fencing

Well-maintained wildlife fencing is an effective way to prevent koalas accessing roads (Clevenger et al. 2001; Ascensao et al. 2013; van der Ree et al. 2015; Phillips 2014). A well-maintained fence has:

- no gaps or holes
- no open gates
- no trees or shrubs growing within 3 metres of the fence line
- no vegetation growing on or overhanging it
- no debris built up around it.

Wildlife fencing also helps direct or funnel animals to road crossing structures. 'Floppy top' wildlife fencing or 1.5-metre-high chain-mesh fence with 500-millimetre-wide metal flashing, has commonly been installed on major road upgrades in NSW to prevent koalas getting onto roads (Figure 1). The NSW Government is shifting away from using floppy top fencing due to cost, difficulty of fixing damage from fallen branches, and urban design considerations.

A 2014 report suggested that koala vehicle strikes along the Pacific Highway in the Tweed and Byron local government areas (LGAs) were clustered near fence ends and road interchanges. Areas adjacent to 1.2-metre-high chain mesh fencing had fewer koala vehicle strikes (Phillips 2014). This suggests that some fencing is better than no fencing.

Advantages of fences
Prevent koalas from accessing roads and prevent vehicle strike when well-designed and maintained
Help maintain habitat connectivity when combined with road crossing structures
Low risk of theft or damage, acknowledging that fallen trees can cause local damage

Disadvantages of fences
Block wildlife movement when installed in long stretches
Lose integrity if gates are left open, koala grids are breached, or when trees fall across or vegetation grows over the fence
Need ongoing maintenance including keeping fences clear of vegetation growth
Local landholder resistance to adding fences/gates/grids along property boundaries

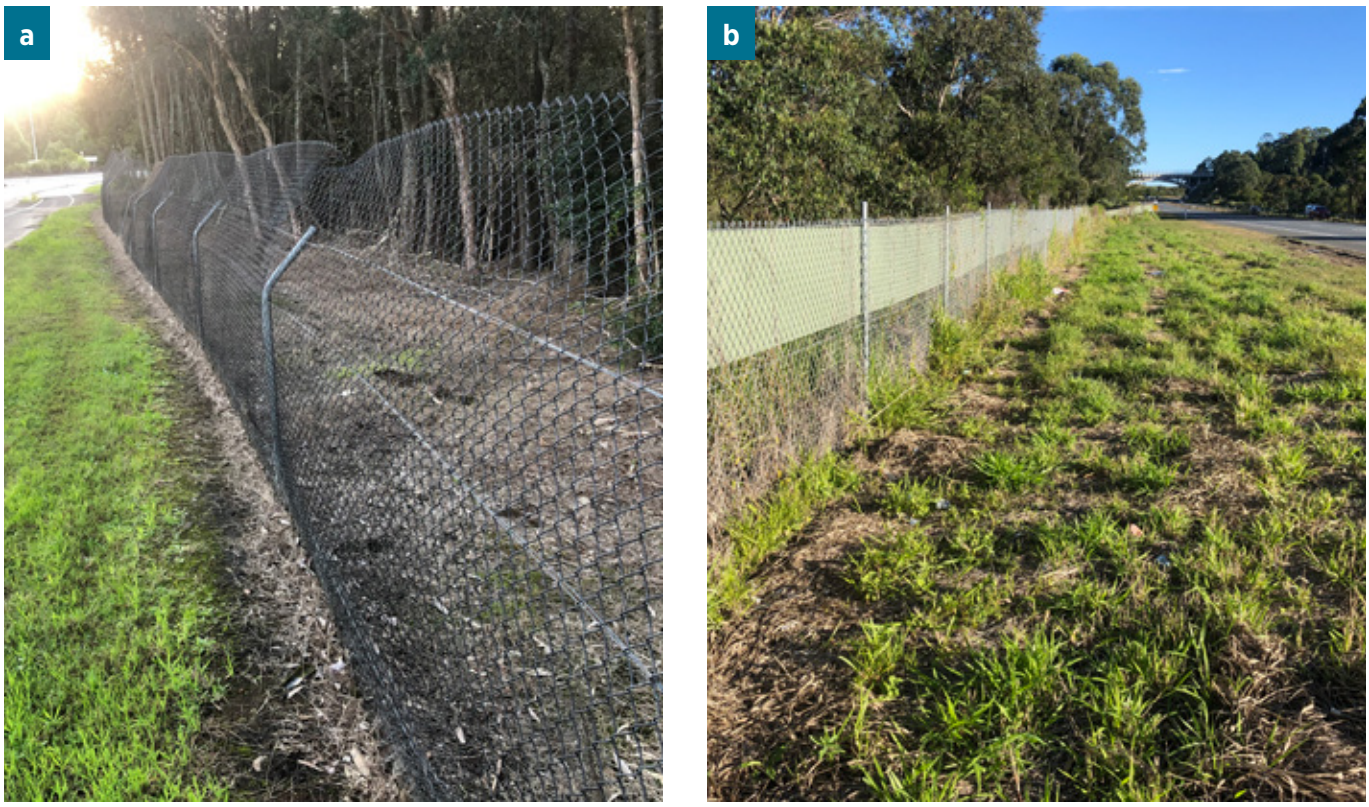


Figure 1 Floppy-top wildlife fencing (a) and 1-5-metre-high chain-mesh fence with flashing (b), feature on long sections of the Pacific Highway upgrade in northeast NSW. (Sandpiper Ecological)

Road crossing structures

Long sections of fence prevent koala movement across the landscape. Fences should only be installed with appropriate road-crossing structures that allow safe passage for koalas. Fencing must take existing and planned land uses along the road into account.

Koala crossing structures are typically associated with road upgrades in bushland areas where koalas are known to live and where a road upgrade presents a new habitat connectivity barrier. Koalas have been recorded using crossing structures, including reinforced concrete box culverts (a passage under a road), land bridges and bridge underpasses at numerous locations across NSW (Figure 2a–c). The width and height of a box culvert may be guided by the length of the culvert (Biolink 2018), but additional monitoring of existing culverts and pipes for koala movement is still required. Use of culverts by koalas may also depend on factors such as alignment (whether the animals can see the other side of the culvert; whether it looks like a cave or dead end), traffic noise and whether it provides dry passage.

Wildlife furniture such as timber posts and rails have been installed in box culverts and bridge underpasses to provide koalas with an alternative to walking along the ground (Figure 2). Despite their inclusion, most koalas appear to travel along the ground and not the timber furniture (Sandpiper 2017, 2019). Other tree dwelling and climbing species, such as brush-tailed phascogales (*Phascogale tapoatafa*), are known to use them. However, timber refuge poles are still recommended as they may help koalas escape dog attack (Figure 2d).

Advantages of road crossing structures
Link habitat across road corridors
Provide safe passage across/over or under road corridors
Disadvantages of road crossing structures
New structures are very expensive
Difficult to retrofit to existing roads

Figure 2 Koalas have been recorded using crossing structures at numerous locations across NSW including a land bridge near Sleepy Hollow (a), and box culverts near Halfway Creek (b) and Warrell Creek (c). Bridge underpasses, such as at Pine Creek complete with refuge poles and timber post-and-rail furniture (d), provide koalas safe passage under highway corridors. (Sandpiper Ecological)

Modifying existing structures

Installing a box culvert or land bridge on an existing road is prohibitively expensive. A more cost-effective approach is to modify or enhance existing infrastructure. For example, koalas may be funnelled towards an existing bridge underpass, box culvert or large pipe by connecting or 'tying-in' sections of fence to these structures. Importantly, fence tie-ins that lead to crossing structures should extend more than 50 metres on either side of the structure to avoid 'fence-end effect'. Where fence tie-ins are shorter than 50 metres, animals may be more likely to find their way back onto the road and be struck by a vehicle (Plant et al. 2019).

Culverts and bridge underpasses that are wet can be enhanced by installing raised dry-access ledges (see Case study). The same approach could be applied to pipes greater than 1.5 metres in diameter, although impact on water flow needs to be considered.

Advantages of modifying existing structures
Less expensive than a new structure
Funnels animals to a crossing when combined with fence tie-ins
Disadvantages of modifying existing structures
Site constraints (e.g. deep, standing water) may increase cost of modification
Tie-in fencing increases cost

Case study: Below-bridge koala ledge retrofit

In response to high numbers of koala vehicle strikes on a highway in Victoria Point in southeast Queensland, wildlife furniture helped create a crossing for koalas. Fencing and wooden ledges along the edge of a bridge batter, or sloped wall, were installed to funnel koalas to the crossing and provide dry, safe passage under the road (Figure 3). At least two koalas were recorded using the ledge more than 17 times during the 2-year study (Dexter et al. 2016).

Figure 3 Ledge along the edge of a bridge batter and photograph of koala using the ledge. (Sandpiper Ecological)

Koala grids

Long, continuous fencing also needs to be managed where it encounters a crossroad. 'Koala grids', a modified version of cattle grids, can provide a solution (Figure 4). Koala grids installed on a road in the Lismore LGA reportedly prevented koala roadkill over a 6-year period (Biolink 2018). No koala vehicle strikes were recorded at a koala grid near Bagotville (Sandpiper Ecological, unpub. data).

Advantages of koala grids
Prevent koalas accessing roads when continuous fencing crosses a side road
Maintain flow of human traffic
Disadvantages of koala grids
Minimal data demonstrating effectiveness
Unknown impacts on wildlife that might get stuck in the grid
Unknown fence-end effect when koalas attempt to cross roads nearby

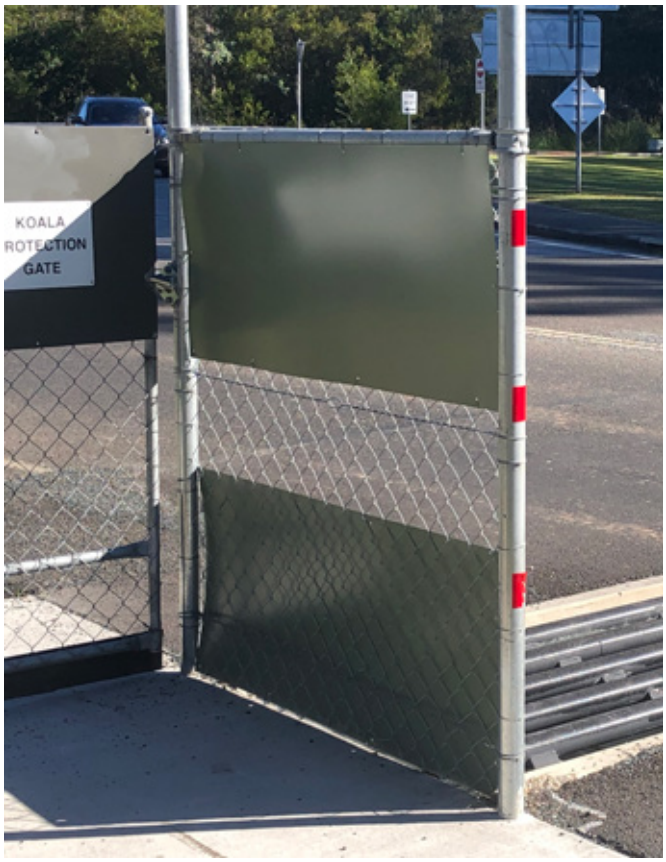
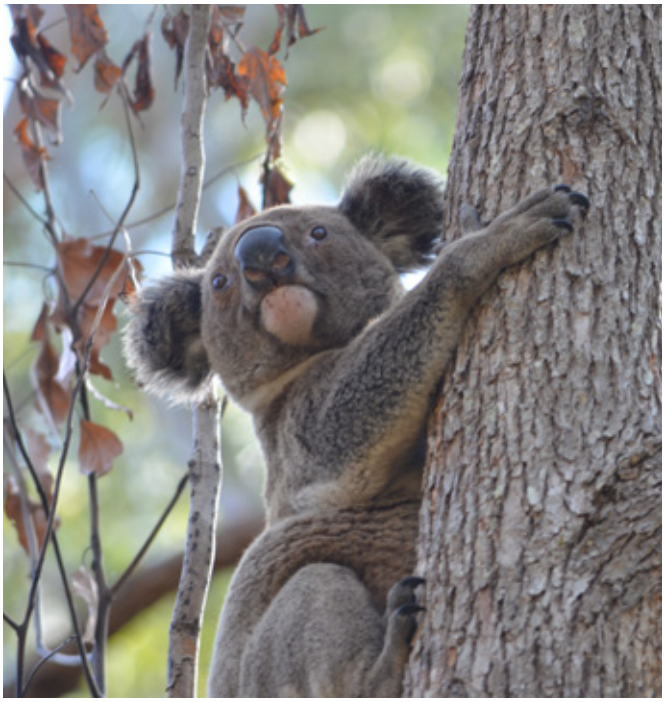


Figure 4 Koala grids have been installed at numerous locations where continuous fencing encounters a crossroad, such as in Byron Local Government Area. (Sandpiper Ecological)



Escape structures: ramps, humps, wing-wall drop-downs and poles

When animals become trapped inside a fenced road corridor, escape ramps, escape humps, escape poles and culvert wing-wall drop-downs can provide an escape route for koalas and other wildlife (Figure 5). A wing-wall drop-down is a hole in the fence along a culvert wall that is high enough to prevent wildlife entering the road corridor, but low enough that an animal in the road corridor could drop down into the culvert without injury (Figure 5c).

The effectiveness of escape ramps and escape humps for koalas and other wildlife is equivocal. There is no reported evidence of a koala using an escape ramp, escape hump or culvert wing-wall drop-down. Further, escape ramps on the Oxley Highway at Port Macquarie enabled kangaroos, wallabies and bandicoots to move in the reverse direction and access the road (Goldingay et al. 2018). Raising the height of the ramp end to 1–1.2 metres may resolve this.

Monitoring suggests the shape of escape humps may deflect wildlife rather than encourage or enable use (Sandpiper Ecological, unpub. data; Figure 5b). Wing-wall drop-downs next to culverts have not been monitored, but the principle of providing both an escape and access to a crossing structure has merit.

Escape poles are timber poles installed on the road side of wildlife fences to enable koalas to escape from the road corridor (Figure 5d). There is no reported monitoring of these structures and their use on road upgrades is limited. Despite this, escape poles represent a cost-effective and targeted

approach and are worth investigating. An escape pole installed in the Port Macquarie LGA includes a solid post on the roadside of a fence joined to a short cross bar. The cross bar joins to another vertical pole that extends about 1-metre above the ground on the bush side of the fence. This would enable a koala to escape from the roadside and jump down on the bush side. The post on the bush side of the fence is high enough off the ground to prevent koalas gaining access to the road.

Based on current knowledge, escape structures are recommended for long sections of fencing and adjacent crossing structures (e.g. culvert wing-wall drop-downs), and near fence ends using escape ramps or escape poles. Escape humps are not recommended at any location as they tend to deflect wildlife back into the road corridor.

Advantages of escape structures
May provide escape for animal (koala) trapped within a fenced road corridor
Escape pole is a more targeted escape structure and worthy of trials
Wing-wall drop-downs next to box culverts and bridge underpasses should be included at fence tie-ins to provide animals an escape route
Disadvantages of escape structures
No recorded use by koalas
May enable animals outside fence to gain access to road

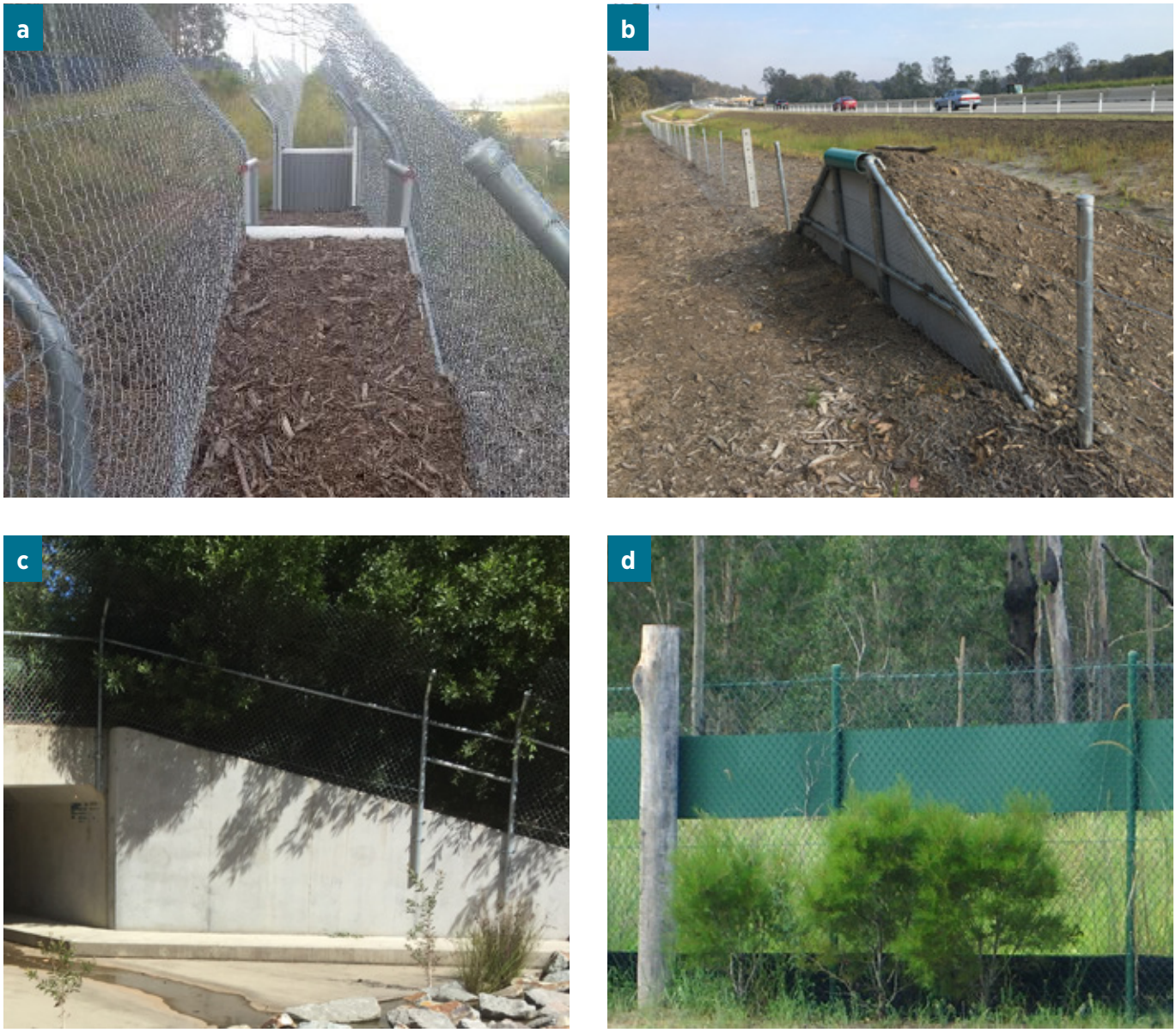


Figure 5 A variety of escape structures on the Pacific Highway upgrade: an escape ramp at Woolgoolga (a), escape hump at Halfway Creek (b), and a culvert wing-wall drop-down at Urunga (c). Escape poles for koalas (d) were installed on the Compton Road upgrade in Brisbane. (Sandpiper Ecological)

Virtual fences

Virtual fencing is based on a series of small, electronic devices mounted on short, roadside posts (Figure 6). Headlights activate the devices, which emit sound and light intended to alert and repel animals and stop them from entering the road. A device is positioned every 25 metres for the length of the road involved.

Small-scale trials in a remote area of western Tasmania reported reductions in road mortality of small marsupials (Fox et al. 2018), although there were issues with the study design (Coulson & Bender 2019). Wildlife living in urban or peri-urban roadside habitat are often habituated to light and sound and unlikely to be averted by such devices. It is also unlikely the sound and light stimulus emitted by the unit would be sufficient to deter a koala from crossing the road.

Further trials of virtual fencing are needed to determine whether this technology can effectively prevent koala vehicle strikes. However based on current knowledge, virtual fences are not recommended for preventing wildlife vehicle strike.

Advantages of virtual fences
Reduction in small marsupial roadkill at a remote location in Tasmania
Low maintenance
Disadvantages of virtual fences
Limited trials with questionable results
Expensive
Possible habituation by animals that live near devices
Not tested on koalas
Theft and/or vandalism of units

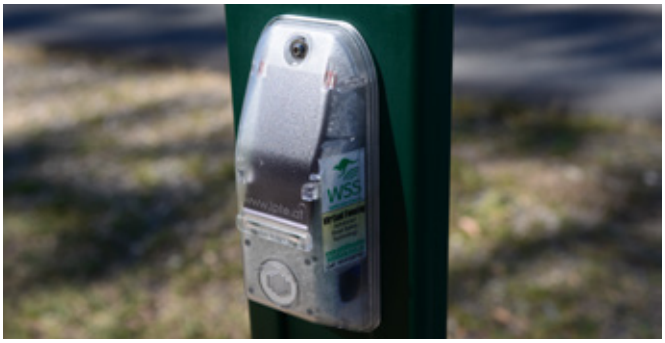


Figure 6 Virtual fence post with sensor on the side of a road. Approaching car headlights activate the sensor which emits sound and light to deter animals from crossing the road. (Wildlife Safety Solutions)

Reflectors and audio deterrents

Reflectors mounted to roadside posts are designed to deter animals from crossing roads by deflecting light from the headlights of oncoming vehicles into roadside habitat to provide a visual warning. Wildlife audio deterrents mounted to the front of vehicles emit high-frequency sound to alert and ward off animals from roads. There are no reports to show that roadside reflectors or audio deterrents reduce wildlife vehicle strike (D'Angelo & van der Ree 2015).

Based on current knowledge, roadside reflectors and/or audio deterrents are not recommended for preventing wildlife vehicle strike.

Advantages of reflectors and audio deterrents
Low cost
Low maintenance
Disadvantages of reflectors and audio deterrents
No evidence to support effectiveness in reducing wildlife vehicle strike
Audio deterrents require uptake by drivers
Theft/vandalism of reflectors

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More information

Find out more about koalas on our Koala webpage.

Cover photo: Koala released back into the wild after sustaining injuries in wildfires near Numeralla, south-east NSW. (Lucy Morrell/DPIE)

Page 5: Koala, *Phascolarctos cinereus*, between the Tweed and Brunswick Rivers east of the Pacific Highway. (Scott Hetherington/DPIE)

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