Corridor Risk Assessment Needed

A Submission about the draft National Wildlife Corridors Plan

April 2012

invasive species council

ISC campaigns for better laws and policies to protect the Australian environment from weeds, feral animals, exotic invertebrates and pathogens.

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The Invasive Species Council campaigns for better laws and policies to protect the Australian environment from weeds, invasive animals and exotic pathogens.

Formed in 2002, we were the first environment group in the world to focus solely on invasive species.

With introduced pests one of the top and growing threats to native species and ecosystems, involving complex biological and social interactions, this specialist focus is needed.

A non-profit organisation, we work with other groups on policy and legal reform, campaigning for action on high priority pests.

We have a strong commitment to using the best science available to inform our advocacy work and through our board, staff and supporters have access to excellent in-house weed and pest expertise.

The Invasive Species Council is committed to fostering community participation and activism, encouraging people to have a voice on invasive species issues.

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Introduction

This submission focuses on two invasive species issues that should be given a high priority in assessing proposals for new corridor connections:

- The potential for new corridors to facilitate the spread of some invasive species, warranting risk assessment to identify those species and the level of risk
- The potential for invasive species to compromise the environmental functions for which corridors are proposed unless they are managed, warranting prior assessment of management issues and costs.

Corridors and invasive species

Corridors have long been recognised as posing risks as well as providing benefits for biodiversity. They can facilitate the spread of threatening processes such as fire and feral animals. Thomas Lovejoy (1995) noted in the book, Connectivity Conservation:

> 'there is still much to be learned about the science of connectivity. It is not an unalloyed "good" thing so that for example it can promote the dispersal of invasive species (Crooks and Suarez chapter 18) and disease agents (Callum and Dobson Chapter 19).'

A major CSIRO report (Dunlop and Brown 2008) warned about fire:

> 'Increasing connectivity, in particular connecting isolated patches of habitat, might also facilitate the spread of fire. This could lead to more extensive fires and more uniform fire histories resulting in reduced opportunities for fire sensitive species.'

Invasive species and inappropriate fire regimes are the second and third main threats to Australia's threatened biodiversity (Evans et al. 2011), and the most expensive and difficult management issues in protected areas, so it is vital that corridor proposals fully consider their implications. This is not evident in the National Wildlife Corridors Plan.

Dunlop and Brown (2008) warned as well about the potential of climate change to facilitate problems by encouraging unwelcome movement of native species. The example they provided is of red-necked wallabies (*Macropus rufogriseus*), which are moving to higher altitudes in the Australian Alps, posing a long term threat to alpine herbs. Low (2008) also warned about this potential, and noted that laughing kookaburras (*Dacelo novaeguineae*) are moving higher in the Alps and preying on alpine skinks, which do not recognise them as predators.

The Dunlop and Brown (2008) report is one of the most important assessments of climate change yet undertaken, and it warns that:

> 'careful assessment of the possible risks as well as advantages of connectivity may be warranted before substantial efforts are made to increase connectivity, particularly in relation to species of high conservation value or that are dependent on climatic refuges.'

Our principal concern is that this recommendation, which is made twice by Dunlop and Brown (2008, pages 96 and 108), is not reflected in the draft National Wildlife Corridors Plan. We fear that without risk assessment, new corridor projects may sometimes promote the spread of pest animals, weeds and other threatening processes, with long term negative consequences. We recognise that most corridor projects are about strengthening existing connectivity, and we welcome the benefits this provides. Our concerns are reserved for those corridor components that create habitat links that do not currently exist. Some of the recent connectivity literature downplays the risks these pose. A report for the Department of Sustainability, Environment, Water, Population and Communities, Connectivity Conservation in Australian Landscapes (Worboys and Pulsford 2011), notes past criticisms of corridors (without listing them) and says this:

> 'Thirty of such problems were identified and analysed very carefully by ecologists, and the finding was that potential disadvantages of corridors do not negate the benefits nor the necessity of corridors (Hilty et al, 2006). These debates are considered to be over (Hilty pers comm, 2010)...'

This seriously misrepresents the situation. Worboys and Pulsford (2011) describe connectivity conservation as a 'paradigm shift from traditional practices of conservation planning'. The Invasive Species Council recommends a paradigm shift towards better understanding and management of invasive species. Our concern is that responses to climate change, including the promotion of biofuels and corridors, carry invasive species risks that are poorly understood.

While increasing connectivity undoubtedly has benefits in many areas, we do not believe that a universal shift towards connectivity is realistic, because conservation in Australia is so often about reducing connectivity (Dunlop and Brown 2008). Invasive species pose the main threat to Australian mammals (Johnson 2006), which are often protected by enclosing them behind predator-proof fences or relocating them to islands. We note the following examples:

- The Australian Wildlife Conservancy and Arid Recovery have fenced reserves to exclude feral cats, rabbits and foxes, to provide a refuge for threatened mammal species.
- In Project Eden in Western Australia a peninsula in Francois Peron National Park has been fenced to provide a reintroduction site for threatened mammals.
- In central Queensland a fence was built around in Epping Forest in central Queensland to protect the endangered northern hairy nosed wombat from dingoes.
- In the Northern Territory Garig Gunak Barlu National Park was fenced to prevent introduced banteng from spreading outside the park.
- In the Northern Territory northern quolls have been translocated to islands to provide habitat for them away from cane toads.
- In Western Australia and South Australia a wide range of threatened species have been translocated to islands to protect them from foxes and cats.

In the connectivity literature, invasive species are recognised as a major threat (Worboys and Pulsford 2011, Mackey et al. 2010), but connectivity is proposed as the solution, with no supporting evidence. The argument made is that larger areas of habitat are more resilient in the face of human impacts, but the experience in Australia has often been that isolated patches of habitat provide the best protection for threatened mammals. As Dunlop and Brown (2008) note: 'Reducing connectivity is actually a mainstay of many threatened species programs.' Mammals that have vanished from hundreds of thousands of square kilometres of mainland habitat have sometimes survived on small islands, for example the burrowing bettong (*Bettongia lesueur*), rufous hare-wallaby (*Lagorchestes hirsutus*), greater stick-nest rat (*Leporillus conditor*) and Shark Bay mouse (*Pseudomys fieldi*) (Van Dyck and Strahan 2008).

The need to reduce connectivity also applies to other groups, for example plants that need protection from herbivores or from introduced diseases such as Phytophthora.

We note with concern that the draft National Wildlife Corridors Plan contains the following statement:

> 'Natural connectivity in landscapes helps ensure that native species are more resilient to threats, such as those posed by invasive species.'

This statement is misleading and should be changed or removed. Invasive species management should be guided by improved understanding of the issues rather than by rhetorical claims that do not stand up to scrutiny. There is little evidence in Australia to support the contention that landscape connectivity protects native species from invasive species, and much evidence to suggest it does not. Feral animals often thrive in regions with vast tracts of intact vegetation (for example Cape York Peninsula and Arnhem Land). Most animal extinctions in Australia post European settlement have occurred in intact areas and have been due to invasive species (mammals from foxes and cats, island birds from rats, frogs from chytrid fungus).

The recent report Into Oblivion: The Disappearing Native Mammals of Northern Australia (Fitzsimons et al. 2010) highlights a looming extinction crisis in the region of Australia where connectivity is highest:

> 'Many mammal species are in sharp decline across the north, even in extensive natural areas managed primarily for conservation... Based on current trends, many native mammals will become extinct in northern Australia in the next 10-20 years, and even the largest and most iconic national parks in northern Australia will lose native mammal species.'

Feral animals and changed fire regimes are identified as the main threats operating in a region where connectivity, by global standards, is exceptionally high:

> 'Worldwide, extinction is mostly the lot of animals and plants that unhappily occurred in areas subject to the most marked environmental change, of broad-scale clearing and intensive development, of very high human population density, or of direct unsustainable hunting pressure. But these are not characteristics of northern Australia, which remains spectacularly natural in appearance and essence, with remarkably few people, relatively little intensive development, and extensive areas protected in conservation reserves. Indeed, northern Australia claims the title of the world's largest intact tropical savanna.'

As for weeds, it is true that large tracts of native vegetation are more resistant to weed invasion than small remnants with a high edge to core ratio, but what is important is not connectivity but the ratio of edge to core. The implications of this for management are considered in the next section.

We emphasise these issues because the draft National Wildlife Corridors Plan, while noting concerns that corridors could benefit pests, is largely dismissive of the negative potential:

> 'One concern raised about wildlife corridors is that they could become pathways for invasive plants and animals. However, case studies have shown that some of the most serious invasive species—such as cane toads, foxes and some weed species—are most likely to disperse and move through areas of disturbed vegetation and along cleared pathways such as roads. Areas of dense native vegetation are likely to be better protected against invasion and might help to reduce the overall dispersal of invasive species. Specific management regimes and initiatives to control invasive plant and animal species are an essential component of corridor design.'

We agree that most invasive species can disperse without corridors, but the exceptions are so serious they should be highlighted. In a report for the Queensland Department of Environment and Resource Management, Low (2011) warned about the potential for sambar deer (*Cervus sambar*) to spread along a Great Eastern Ranges corridor.

Sambar are capable of 'significant, severe and possibly lasting alteration to vegetation structure, including negative feedback loops that lead to destruction of particular vegetation types such as rainforest and wetlands' (Peel et al. 2005). They alter and deflect rainforest successional dynamics with the plants either being killed or prevented from regenerating. Regeneration failure and gap openings expose soils and lead to disruption of internal rainforest moisture homeostasis through the loss of vine thickets and curtains, and understory shrubs, increasing the risk of fire. Several nationally threatened plants are threatened by deer (primarily sambar) herbivory and trampling. In East Gippsland, Peel et al. (2005) recorded severe browsing pressure and listed about 50 species 'severely and adversely affected' by browsing. Sambar can devastate regrowth after fire or logging and can prevent seedling establishment by destroying thickets that act as nursery sites or regeneration refuges. They have been listed as a potential threatening process in Victoria. See images below of damage caused by Sambar.

Sambar are found mainly in the tropics and subtropics of Asia (Wilson and Mittermeier 2011). They may reach higher densities and harm more species in the forests of northern New South Wales and Queensland than they do in Victoria. They are forest inhabitants that avoid open country and could be expected to

Damage caused by sambar rutting in warm temperate rainforest

Failed gap regeneration due to sambar damage in littoral rainforest

Damage caused by heavy browsing of muttonwood in dry rainforest (left) by sambar, and fig (right) by rusa deer.

Pictures: Rohan Bilney, Tim Low.

benefit from corridor creation. They could use a Great Eastern Ranges corridor to spread north. It is of concern to the Invasive Species Council that the main report advocating the Great Eastern Ranges Corridor (Mackey et al. 2010) does not mention the potential of deer (or other invasive species) to benefit from this corridor.

The rusa deer (*C. rusa*) is another invasive species that could cause environmental harm by spreading along corridors. Rusa in high densities substantially reduced diversity in three vegetation communities in Royal National Park, implicating them as 'gross habitat changers' (Moriarty 2004b). In littoral rainforest plots subject to high deer density the mean number of plant species was 17 compared to 37 in plots subject to low deer density. Assessing volumes in the rumen of rusa in Royal National Park, Moriarty (2004b) found they ate an 'alarming' amount of native vegetation, likely to have 'profound consequences' for the National Park, a relatively small area with high habitat diversity.Moriarty (2004b) also found that swamp wallaby numbers in Royal National Park are depressed by rusa. In most of their range, the wallabies achieve densities of 8-19 animals/km2 but densities in the national park are an estimated 2.2-2.7 animals/km2, with highest densities where deer densities were lowest.

Bioclimatic models show a vast potential for expansion of all deer species into new areas (Moriarty 2004a). As Moriarty (2009) says, 'If deer population trends in Australia continue to increase at their current rate, deer species are likely to rival both feral pigs and feral goats in distribution, abundance and impacts in the near future.' The Invasive Species Council has reviewed evidence for deer problems for a federal key threatening process nomination (download at http://www.invasives.org.au/documents/file/ISC_submission_IPA_framework_sep09.pdf)

Pigs and goats are also animals that are likely to benefit from corridors in some regions where connectivity is currently limited.

Some weeds also spread along corridors. In landscapes dominated by pastures, corridors provide the main opportunity for spread of many species. Bridal creeper (*Asparagus asparagoides*) is a Weed of National Significance that is kept out of paddocks by grazing pressure but it spread rapidly along treed corridors by seed-excreting birds. It invades intact native vegetation, where it is very difficult to control (ARMCANZ et al. 2000). Olives (*Olea europaea*) and peppercorn tree (*Schinus areira syn S. molle*) are other examples of weeds that spread in this way, according to weed experts we have conferred with. Most weeds do not need corridors for dispersal and problems are most likely to arise in landscapes where intense grazing (which controls many weeds) is the main land use.

Corridor Risk Assessment

The National Wildlife Corridors Plan should embrace the precautionary principle by proposing that a risk assessment process be undertaken before corridor projects are approved. Australia has Weed Risk Assessment that is applied when new plants are proposed for importation into Australia, and the growing popularity of connectivity conservation warrants the development of a Corridor Risk Assessment as well. Whenever a proposal is made to create new habitat links, a series of questions should be asked about the potential of feral animals, weeds, pathogens, fire and problem native species to benefit and their propensity to undermine the potential to achieve the desired environmental outcomes. Corridors should exclude areas where important conservation values depend on isolation from threats.

Mackey et al. (2010) noted that careful choices must be made about the funding of corridors:

> 'difficult choices must be made regarding the most efficient investment of available resources for conservation efforts. In the case of GER [Great Eastern Ranges], the spatial priorities in and around the connectivity area will vary from time to time depending on, among other things, the availability of resources, changing threats, and the likely benefits and costs of alternative investment options.'

The threats and costs to be considered should include those that might arise from increasing connectivity. We expect that under most circumstances a Corridor Risk Assessment process would find that a corridor component posed little risk, but that in a small number of locations the risks would outweigh the benefits, and in such circumstances connectivity should not be increased.

Corridor management issues and costs

To function as intended – as habitat links for native species – wildlife corridors will need rigorous management of invasive species, problem native species and fire (which will be interactive threats). These costs should be assessed and factored into corridor proposals.

The draft plan acknowledges the need for management of invasive species:

> In addition, the design and implementation of corridor initiatives should be supported by practical invasive species and fire management plans to ensure that the corridors do not inadvertently encourage the spread of invasive species or create fire hazards.

> Specific management regimes and initiatives to control invasive plant and animal species are an essential component of corridor design.

But to community groups considering the creation of corridors, these brief comments fail to adequately convey the practical challenges and costs of invasive species management. In protected areas, invasive plants and animals, as well as fire, are very problematical. This makes them the most costly aspects of management. The difficulties and costs will be considerably greater in corridors due to their high edge to core ratios. As well as weed and pest incursions, edge effects can include physical disturbance of soil and vegetation, nutrient enrichment, microclimate impacts, fire and poor tree health.

Because of edge effects, the per hectare costs for management are likely to be considerably higher in corridors than for other protected areas with less linear shapes. Here is one scenario:

> The edges of these corridors will be subject to the ingress of weeds from the highly disturbed edge habitat and while this may not amount to a flood of any one species it will mean that the corridor will be subjected to continual and varied pressure from numerous species of plants that take advantage of the edge habitats. One example of species that would most likely take advantage and move into the corridor would be hard seeded legumes, both native and introduced. The disturbed edges would provide a regular recruitment of these plants which then grow, produce more seed some of which will move into the corridor. Even if recruitment within the corridor is limited there will be continual seed pressure from the corridor edges and of course once the eventual fire comes along the whole corridor will become a mass of seedling legumes. (Rod Randall, posting to Enviroweeds email forum, 5 April 2012)

The plan should place more emphasis on invasive species as management problems associated with corridor development. Our concern is that corridor projects will be initiated without a proper understanding of the management issues that invasive species will pose unless these receive due emphasis and are fully factored into proposals. One risk is that funding for invasives management will be contingent on grants that are not renewed.

For corridors to function as productive habitat for native species, it will be important to ensure their width considerably exceeds the distance over which edge effects are experienced. This distance will vary depending on the type of vegetation and pressures.

Where corridors serve as buffers to protected areas and other intact habitat – and this is one of the three corridor elements mentioned in the plan – they are likely to reduce the edge effects for those core areas, achieving a positive outcome.

The edge effect of weed invasion can extend for a considerable distance into vegetation. Foxcroft et al. (2010) addressing the question of what 'would constitute an effective and sustainable width of buffer to reduce incursions' into a national park found a strong edge effect in Kruger National Park that extended up to 1.5 km, the threshold at which the number of non-native plants decreased sharply and became constant.

In the Blue Mountains, Smith and Smith (2010) found that weed invasion extended up to 60 metres into protected bushland areas at 50 survey sites where bushland abutted urban areas separated by a perimeter road. The greatest inward incursions were in areas where housing had been established the longest.

Corridors should also be wide enough to prevent domination by problematic edge-favouring animals, whether exotic or native. Clarke and Oldland (2007) found that 'many vegetation corridors currently being planted within the noisy miner's range are likely to become totally dominated by noisy miners'. These aggressive birds commonly range 150-300 m into woodland habitats.

Additional note

On another matter, we note that the following statement on page 6 has been invalidated by recent research (Roberts et al. 2011).

> 'Some changes in range have already been observed as a result of consistently warmer temperatures. For example, it is thought that a reduction in the number and severity of frosts has enabled the Black Flying Fox to expand its range more than 750km to the south in the past 75 years.'

Roberts et al. found that climate change did not explain the rapid 1168 km southward range extension (about 100 km/decade) of Black flying-foxes. They have moved into locations colder than they occupied previously, including frost-prone locations.

Summary

We request the National Wildlife Corridors Plan Advisory Group to make changes to the draft plan.

- It should be clearer about the potential of corridors to threaten biodiversity by listing examples of damaging invasive species that can benefit from corridors, such as forest deer, rather than only mentioning invasive species that will not benefit from corridors.
- It should recommend that Corridor Risk Assessment occurs before corridors are approved.
- It should give greater emphasis to the challenges and high costs of managing invasive species that will be essential to ensure that corridors have sufficient habitat values.
- It should remove the following misleading statement: 'Natural connectivity in landscapes helps ensure that native species are more resilient to threats, such as those posed by invasive species.'

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