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Connectivity conservation

4.1 Connectivity conservation involves 'conserving or re-establishing interconnected areas and corridors of vegetation to protect linked ecosystems and the species within them'.[1] The 2011 State of the Environment report stated that connectivity conservation areas, also known as corridors and biolinks:

> … interconnect protected areas, help maintain large-scale natural Australian landscapes and ecosystem processes, and are a natural and critical partner in biodiversity conservation to the National Reserve System. These areas are a critical conservation response to climate change. They provide opportunities for species to move, interact, adapt and evolve as higher temperatures and changed rainfall patterns cause ecosystem shifts at a landscape scale.[2]

4.2 The National Reserve System (NRS) is Australia's network of parks, reserves and protected areas—including Indigenous Protected Areas (IPAs) and private land conservation areas—covering approximately 13.4 per cent of the country.[3]

4.3 The National Representative System of Marine Protected Areas (MPA) covers approximately one third of Australia's oceans—3.1 million square

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1 State of the Environment 2011 Committee, *Australia State of the Environment 2011: An independent report presented to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities*, Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC), Canberra, 2011, Glossary, p. 906.

2 State of the Environment 2011 Committee, *Australia State of the Environment 2011: An independent report presented to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities*, DSEWPAC, Canberra, 2011, p. 357.

3 DSEWPAC, 'The National Reserve System (NRS)', <http://www.environment.gov.au/parks/nrs/index.html> viewed 15 January 2013; DSEWPAC, 'The National Reserve System (NRS) – Private landholders', < http://www.environment.gov.au/parks/nrs/getting-involved/private.html> viewed 15 January 2012.

kilometres of ocean—and is managed primarily for biodiversity conservation.[4]

4.4 The National Wildlife Corridors Plan (NWCP) is 'the Australian Government's framework to retain, restore and manage ecological connections in the Australian landscape'—a landscape scale approach to biodiversity conservation.[5]

4.5 The following list includes the major connectivity conservation areas in Australia:

- Great Eastern Ranges (GER) Initiative corridor (2800 kilometres from central Victoria to Far North Queensland)
- Gondwana Link (1000 kilometres in south-west Western Australia)[6]
- Trans-Australia Eco-link Corridor (3500 kilometres in South Australia and the Northern Territory)
- Tasmanian Midlandscapes (up to 64 000 hectares in Tasmania)
- Habitat 141° (18 million hectares, stretching 700 kilometres from north to south along the 141° meridian, across the borders of South Australia, New South Wales and Victoria)
- NatureLinks, a set of connectivity conservation projects led by the South Australian Government (five separate corridors, two of which form part of the Trans-Australia Eco-link Corridor, in South Australia)
- Northern Australia Tropical Savannah Lands Corridor and Kimberley Landscape Conservation Areas (3000 kilometres in Western Australia, the Northern Territory and Queensland)
- Biolinks (various parts of Victoria).

4.6 As noted above, the NRS is described as a 'natural and critical partner' to connectivity conservation areas in biodiversity conservation. This chapter will therefore outline the purpose of the NRS before assessing the benefits and challenges of connectivity conservation.

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4 DSEWPAC, 'Commonwealth Marine Reserves', <http://www.environment.gov.au/marinereserves/index.html> viewed 16 January 2012.

5 DSEWPAC, *National wildlife corridors plan: A framework for landscape-scale conservation*, DSEWPAC, Canberra, 2012, p. 1.

6 The Great Eastern Ranges Initiative corridor and Gondwana Link were considered by the Committee during its program of site inspections - see House of Representatives Standing Committee on Climate Change, Environment and the Arts, *Case studies on biodiversity conservation: volume 1*, May 2012, pp. 14-15, 41-43.

The National Reserve System

4.7 As noted above, the NRS covers approximately 13.4 per cent of Australia.[7] One of the stated national targets in the NRS Strategy is to, by 2030:

> Include critical areas to ensure the viability, resilience and integrity of ecosystem function in response to a changing climate, such as large and small refuges, critical habitats, broad landscape-scale corridors, places of species and ecosystem richness, sites of endemism and sites that support threatened species and/or ecological communities, and places important for the stages in the life cycle of migratory or nomadic species, to act as core lands of a broader whole of landscape approach to biodiversity conservation.[8]

4.8 The 2011 State of the Environment report observed that assessing the adequacy of the NRS is difficult because there is no nationally agreed approach to its assessment, and that its objectives are not entirely clear.[9] Further, that the long-term achievement of the comprehensiveness, adequacy and representativeness criteria is difficult, possibly due to a mismatch between targets and allocation of resources to achieve them; and that considerable expansion is still required in order to achieve adequate protection of threatened species within the system. The 2011 State of the Environment report concluded that effective off-reserve conservation is important.[10]

4.9 The Committee is aware of a view that all types of protected areas should be integrated into a single national system, with better integration between off-reserve conservation and protected areas.[11] Dr Robert Lambeck, former Chief Executive Officer of Greening Australia (WA)

7 DSEWPAC, 'The National Reserve System (NRS)', <http://www.environment.gov.au/parks/nrs/index.html> viewed 15 January 2013.

8 Australian Government, *Australia's Strategy for the National Reserve System 2009-30*, endorsed by the Natural Resource Management Ministerial Council, Canberra, May 2009, p. 13. (NRS Strategy)

9 State of the Environment 2011 Committee, *Australia State of the Environment 2011: An independent report presented to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities*, DSEWPAC, Canberra, 2011, pp. 651, 654.

10 State of the Environment 2011 Committee, *Australia State of the Environment 2011: An independent report presented to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities*, DSEWPAC, Canberra, 2011, p. 654.

11 The Committee was initially aware of this view from the report of the Biodiversity and Climate Change Expert Advisory Group, *Australia's biodiversity and climate change: A strategic assessment of the vulnerability of Australia's biodiversity to climate change – Summary for policy makers 2009*, Summary of a report to the Natural Resource Management Ministerial Council commissioned by the Australia Government, Department of Climate Change and Energy Efficiency, Canberra, 2009, p. 14 (Exhibit 2).

described the importance of complementing the NRS with the private land-use surrounding it, and the interplay between them as being critical.[12] Mr Hamish Jolly, Advisor and former Chief Executive Officer of Greening Australia also discussed the need to break down the on-reserve, off-reserve connections.[13]

4.10 The International Union for Conservation of Nature, World Commission on Protected Areas (IUCN WCPA) advised the Committee of the need to identify refugia outside the NRS and establish them as protected areas, also ensuring that protected areas are interconnected and actively managed across all tenures.[14] The National Parks Association of Queensland advised that the acquisition of these identified refugial areas should be incorporated into natural resource management (NRM) and biodiversity conservation strategies as a priority.[15]

4.11 The Australian Network of Environmental Defender's Offices (ANEDO) stated that, in addition to recognising threats:

> … the design of the reserve system under a changing climate needs to focus on building resilience to climate change by increasing connectivity (through protection of key migration corridors) and identifying and protecting ecological processes and climate refugia.[16]

4.12 ANEDO noted that '[i]dentification of refugia and key migration corridors across bioregions should therefore be a key priority for the identification of proposed protected areas under the NRS'.[17] ANEDO also noted that protected area management plans should include strategies that build resilience and manage for further uncertainty, including 'mandatory requirements to incorporate assessments of climate change impacts and to focus on climate change adaptation'.[18] It was also suggested that adaptive management be incorporated as a management principle under the *Environment Protection and Biodiversity Conservation Act 1999*.[19]

4.13 The Committee was advised about the operation of the South Australian Government's program for the co-management of parks and reserves with

12 Dr Robert Lambeck, former Chief Executive Officer, Greening Australia (WA), *Transcript of evidence*, 7 November 2011, p. 31.

13 Mr Hamish Jolly, Adviser and former Chief Executive Officer, Greening Australia, *Transcript of evidence*, 7 November 2011, p. 34.

14 IUCN WCPA, *Submission 30*, p. 2.

15 National Parks Association of Queensland Inc., *Submission 12*, p. [1].

16 The Australian Network of Environmental Defender's Offices (ANEDO), *Submission 57*, p. 14.

17 ANEDO, *Submission 57*, p. 14.

18 ANEDO, *Submission 57*, pp. 14-15.

19 ANEDO, *Submission 57*, p. 15.

Indigenous Australians. The program provides opportunities for genuine involvement and power-sharing, and builds and improves on the existing formal reserve system. The Committee understands that the South Australian Government was looking at further co-management of parks, including with the Ngarrindjeri community in the Coorong area, and that other jurisdictions in Australia and overseas had expressed interest in these innovative co-management arrangements.[20]

Benefits of connectivity conservation

4.14 The Committee heard that connectivity conservation is an internationally endorsed approach to addressing habitat fragmentation and providing species the best chance at adaptation in the face of a changing climate.[21] Connectivity corridors such as the GER Initiative have been described as vital for mitigating the effects of climate change on biodiversity.[22]

4.15 The Committee discussed the benefits of connectivity conservation with representatives of the Gondwana Link and the GER Initiative. In Perth, the Committee met with a representative of Gondwana Link, as well as representatives from two of their partner organisations, Greening Australia and the Cape to Cape Catchments Group. Near the small town of Michelago, in New South Wales, the Committee met with representatives of the GER Initiative and its regional partner organisation, Kosciuszko to Coast.

4.16 The Committee met with the National Wildlife Corridors Plan Advisory Group at a public hearing in Canberra. Many interested stakeholders also provided evidence to the Committee on the benefits of connectivity conservation.

Refugia in a changing climate

4.17 One of the benefits of connectivity corridors is the provision of vital refugia to species in the face of unexpected changes in climate. As noted in the context of the NRS discussion earlier, such refugia are a priority in biodiversity conservation. The Committee is aware of the work between the South Australian Government, regional NRM boards, non-government organisations and community groups in developing the NatureLinks

20 Mr Greg Leaman, Executive Director, Policy, Department of Environment and Natural Resources (South Australian Government) (DENR), *Transcript of evidence*, 17 May 2012, p. 8.

21 Boobook Declaration Steering Committee, *Submission 11*, p. 6; BirdLife Australia, *Submission 40*, p. 8.

22 National Parks Association of New South Wales (NPA NSW), *Submission 45*, p. 4.

project. In its submission, the South Australian Government stated that the project will build the resilience of social and ecological systems to enable them to adapt to climate change.[23]

4.18 The ACT Government stated that it was engaged in activities aimed at enhancing existing reserve management that would facilitate recovery and restoration of habitat, better control feral animals and weeds, improve fire management practices and enhance riparian areas to better retain water and be more resilient to flash flooding, so as to provide refuges and corridors for biodiversity in a drying climate.[24]

4.19 According to the National Parks Association of NSW (NPA NSW), the GER corridor provides a key opportunity for species to shift their ranges and habitat use to respond positively to climate change.[25] According to the Australian Marine Sciences Association (AMSA), ensuring connectivity among marine populations and regions will be critical to facilitating range shifts of species, in turn helping to mitigate the impact of climate change and maintain the resilience of marine communities.[26]

4.20 Another benefit of connectivity conservation is the ability to incorporate the existing natural elements of the landscape, including the travelling stock route and reserve networks around the country. These networks could form part of connectivity conservation areas as they naturally act as corridors and stepping stones connecting fragmented vegetation across the landscape.[27] It was suggested by the Namoi Catchment Management Authority (CMA) that travelling stock routes should be incorporated into the protected area network.[28]

4.21 The Namoi CMA also stated that '[w]ell managed conservation areas on private land, especially when linked with public lands, could prove to be vital refugia for biodiversity given the threat of climate change'.[29] Mr Greg Leaman, Executive Director of Policy at the then South Australian Department of Environment and Natural Resources, advised the Committee that many people are interested in participating in landscape scale conservation and the key is to engage those landowners and land managers.[30]

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23 DENR, *Submission 80*, p. 2.

24 ACT Government, *Submission 75*, pp. 1-2.

25 NPA NSW, *Submission 45*, p. [3].

26 Australian Marine Sciences Association (AMSA), *Submission 17*, p. 3.

27 NPA NSW, *Submission 45*, pp. 5-6.

28 Namoi Catchment Management Authority (Namoi CMA), *Submission 31*, p. [2].

29 Namoi CMA, *Submission 31*, p. [3].

30 Mr Leaman, DENR, *Transcript of evidence*, 17 May 2012, p. 7.

Community engagement

4.22 Because of their cross-tenure, socially inclusive nature, connectivity conservation projects like the GER Initiative engage broad sections of communities. Such projects often involve governments, landowners, researchers, regional NRM organisations and community groups.[31]

4.23 The Committee was told that the NWCP cannot work without the engagement of private landowners, and that connectivity corridors are about finding ways to improve conservation management in between formally reserved areas, as a complement to the NRS.[32] Dr Judy Henderson, a member of the NWCP Advisory Group, stated that it is important to expand the community's understanding of connectivity conservation through education and information generation programs within the communities.[33]

4.24 Mr Jolly of Greening Australia agreed that investment in landowner education and support is important at the community level, in order to achieve biodiversity at a landscape scale.[34] Mr Jolly suggested the need to focus on capacity building in relation to the Federal Government's Biodiversity Fund program, and that the Federal Government should use existing organisations such as Greening Australia, Landcare and regional NRM organisations to facilitate this.[35]

4.25 The Committee heard from the South Australian Government that the NatureLinks projects seek to integrate conservation with regional development and NRM, and provide a framework for sustainable use. It was stated that the key is to provide the framework and direction, then encourage and allow local implementation. The South Australian Government prepared implementation plans for NatureLinks in order to guide the participant partners as to how to achieve the corridors. The corridors' establishment became a target in the state's strategic plan, which has further evolved in subsequent plans. The NatureLinks principles have also been incorporated into the state's NRM plan, all eight regional NRM plans, the South Australian planning strategy including the 30-year plan for Greater Adelaide, and regional planning documents. The purpose of incorporation into so many different places, it was said, is to

31 NPA NSW, *Submission 45*, p. 5.

32 The Hon. Bob Debus, Chair, National Wildlife Corridors Plan (NWCP) Advisory Group, *Transcript of evidence*, 12 October 2012, p. 20.

33 Dr Judy Henderson, NWCP Advisory Group, *Transcript of evidence*, 12 October 2012, pp. 21-22.

34 Mr Jolly, Greening Australia, *Transcript of evidence*, 7 November 2011, p. 31.

35 Mr Jolly, Greening Australia, *Transcript of evidence*, 7 November 2011, p. 33.

ensure the embedding of NatureLinks in the institutional framework so that it has a longer term and longer lasting effect.[36]

4.26 Mr Rob Dunn, Chief Executive Officer of the GER Initiative, indicated that each of the councils in partnership with the Initiative were identifying opportunities to align their programs with it, and also looking at it in respect of their planning instruments.[37]

4.27 The Committee heard about the success of the Great Barrier Reef Marine Park Authority's Reef Guardian program, as a means to informing and involving the community in issues of biodiversity conservation. The Australian Coral Reef Society (ACRS) proposed that these successful arrangements should be initiated and receive long-term funding in other parts of Australia.[38]

4.28 BirdLife Australia, in its submission, described the importance of investing in and promoting the fact that biodiversity conservation can positively contribute to carbon reduction, and assist in building ecosystem and species resilience, with initiatives such as the Biodiversity Fund and the NWCP being good first steps.[39] Further, that this can be done by using the best available scientific information to identify pathways for climate adaptation for threatened species, and providing adequate funding for land managers to pursue climate adaptation projects.[40]

4.29 Greening Australia stated that improving connectivity is highly complementary to improvements in sustainable agricultural practices.[41] The National Farmers' Federation (NFF) stated that:

> While the National Wildlife Corridors Plan might be a useful tool, NFF notes that there remain opportunities to marry existing conservation land with private land management efforts to deliver wins for biodiversity and agriculture. NFF remains supportive of market-based instruments such as Environmental Stewardship Program and the newly announced Biodiversity Fund.[42]

4.30 The Committee heard from Mr Dunn that the GER Initiative was working with the Atlas of Living Australia to develop citizen science tools to help landowners do self-monitoring, indicating that additional investment was

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36 Mr Leaman, DENR, *Transcript of evidence*, 17 May 2012, pp. 7-8.

37 Mr Rob Dunn, Chief Executive Officer, Great Eastern Ranges (GER) Initiative, *Transcript of evidence*, 2 March 2012, p. 13.

38 Australian Coral Reef Society (ACRS), *Submission 63*, p. [8].

39 BirdLife Australia (formerly Birds Australia), *Submission 40*, p. [8].

40 BirdLife Australia, *Submission 40*, p. [8].

41 Greening Australia, *Submission 24*, p. 4.

42 National Farmers' Federation (NFF), *Submission 43*, p. 16.

needed in order to continue this work.[43] The Committee heard that the challenge is how quickly they can respond to community enthusiasm—the potential and outline for the project are in place but the resources for expansion are not available in order to work effectively at a landscape scale, and are thereby slowing the progress of the initiative.[44]

4.31 The Committee heard about the Perth Biodiversity Project from the Manager of the Project, Ms Renata Zelinova, being initially created as a set of guidelines for local governments, endorsed by the state government, on how to prioritise natural areas for conservation at the local level thereby helping local governments to consider biodiversity early in the land use planning stage.[45] Ms Zelinova described the benefits of the Project as providing:

> … tools and increasing capacity through training and providing … easy access to all spatial environmental information that is available in states through one easy online access rather than going to each individual agency to get that information. They can access it through this new platform that we have developed. Again, for many local governments that have limited GIS capacity that is a significant asset, saving their time and ensuring that the issues are considered. The critical point is that it is early in the land use planning stage, not when we are talking about a subdivision at a property level when it is very often too late and very difficult to have some real outcomes on the ground.[46]

Challenges for connectivity conservation

4.32 The Committee is aware of several areas where caution is urged and where barriers to participation in connectivity conservation projects exist. Included in these are considerations of costs, land use, and appropriate planning, research and monitoring. While the Committee is aware that barriers exist to establishing connectivity in the marine environment, there is limited knowledge of dispersal in most species, which makes predicting

43 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 13.

44 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 14.

45 Mr Renata Zelinova, Manager, Perth Biodiversity Project, Western Australian Local Government Association (WALGA), *Transcript of evidence*, 7 November 2011, p. 12.

46 Mr Zelinova, WALGA, *Transcript of evidence*, 7 November 2011, p. 13.

the effects of climate change on marine connectivity difficult.[47] This section therefore focusses mainly on land-based connectivity challenges.

Costs of managing private land for conservation purposes

4.33 The Committee heard that landowners have a choice as to whether to manage their land as a protected area, and that the costs incurred are legitimate costs to be borne by the landowner. The Committee heard that a significant barrier to participation in private land conservation is funding for people to undertake conservation activities on their land.[48] It was acknowledged that there is assistance available for private landowners, and also scope for partnership projects between government and landowners.[49]

4.34 The NWCP Advisory Group emphasised that private landowners join corridor initiatives voluntarily, and that the corridor forms part of the existing landscape arrangements. It was stated that the control of invasive pests and weeds needs to be an essential component of any corridor design, and that ongoing funding is needed for the ecosystem services provided by landowners and farmers.[50]

4.35 Mr Kevin Evans, Chief Executive Officer of the NPA NSW, proposed that travelling stock routes should be recognised as a national heritage treasure and gain additional funding from the Federal Government in order to protect them as part of the national approach to climate change and biodiversity protection.[51] Mr Evans explained that more federal funding would assist the farmers surrounding the routes; farmers are finding themselves unable to afford to pay the increased rates to fund the routes' management.[52] This funding would assist governments who are faced with the challenge of how to maintain the routes and, according to Mr Evans, would 'do an amazing amount of good for protecting our biodiversity.'[53]

4.36 According to ANEDO, in the face of ongoing climate change, private land conservation schemes will need to increase, and governments will need to

47 AMSA, *Submission 17*, p. 4. Further, the Committee understands that the continental shelf south of the Great Barrier Reef also restricts the movement of corals southward.

48 Ms Nicola Rivers, Environmental Defender's Office Victoria, *Transcript of evidence*, 4 May 2012, p. 9.

49 Mr Leaman, DENR, *Transcript of evidence*, 17 May 2012, p. 11.

50 The Hon. Bob Debus, NWCP Advisory Group, *Transcript of evidence*, 12 October 2012, p. 25; Dr Henderson, NWCP Advisory Group, *Transcript of evidence*, 12 October 2012, p. 26.

51 Mr Kevin Evans, Chief Executive Officer, NPA NSW, *Transcript of evidence*, 28 March 2012, pp. 27-28.

52 Mr Evans, NPA NSW, *Transcript of evidence*, 28 March 2012, p. 27.

53 Mr Evans, NPA NSW, *Transcript of evidence*, 28 March 2012, pp. 27, 30.

address the barriers to participation, including the lack of appropriate incentives and benefits, and the long-term nature of some of the agreements.[54] ANEDO also called for greater coordination of the different private land conservation schemes, even between state and federal governments, in order to ensure that conservation investment is more strategically targeted, and to increase the likelihood of effective overall protection and management.[55] ANEDO suggested that more flexible short-term private land conservation schemes could be a way of introducing landholders interested in conservation, but reluctant to commit to a long-term scheme, into conservation programs, perhaps encouraging participation in longer-term schemes in future.[56]

4.37 It was suggested that a source of funding, such as a national endowment fund, is needed for ongoing stewardship.[57] Ms Penelope Figgis, Vice Chair for Oceania of the IUCN WCPA, gave the example of a petrol levy in Costa Rica which provides a biodiversity support fund, which in turn provides stewardship payments to private landowners to hold forests on their land.[58]

Land use considerations

4.38 The Committee heard from the Namoi CMA that:

> Many investments in biodiversity conservation on private land, outside the formal reserve system, are undermined by surrounding land use decisions. Incentive and market-based mechanisms—often promoted as the solution—can be ineffective if not supported by an effective legislative regime. Existing private land conservation programs need greater support and resourcing and effective monitoring and evaluation needs to be prioritised.[59]

4.39 Conservation covenants are voluntary agreements between a state/territory government and a landowner to conserve the natural environment on the property. They are available all around the country

54 ANEDO, *Submission 57*, p. 25.

55 ANEDO, *Submission 57*, p. 25.

56 ANEDO, *Submission 57*, pp. 25-26.

57 Ms Penelope Figgis, Vice Chair for Oceania, International Union for Conservation of Nature, World Commission on Protected Areas (IUCN WCPA), *Transcript of evidence*, 28 March 2012, p. 22.

58 Ms Figgis, IUCN WCPA, *Transcript of evidence*, 28 March 2012, p. 22.

59 Namoi CMA, *Submission 31*, p. [3].

and exist in perpetuity, with future owners of the land being bound to the conservation covenant.[60]

4.40 Each jurisdiction handles conservation covenants differently. The Committee heard about the South Australian Government's Protected Areas on Private Land project that promotes cooperation and partnerships between the state government and private landowners and Indigenous groups. The private protected areas were being established without a statutory framework in place, with the state government looking to expand and update heritage agreements in order to allow private landowners to enter into agreements focussed on conservation and biodiversity.[61] Mr Dunn of the GER Initiative stated the objective of conservation covenants as being to better facilitate and encourage private landowners to manage their land for conservation purposes, by making it easier for them to enter into transparent, formal statutory arrangements that would exist in perpetuity.[62]

Planning, management, research and monitoring

4.41 The Committee understands from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) that there are governance barriers that could impact upon the effective management of populations and survival of species in future. Dr Craig James of the CSIRO stated that:

> Currently a lot of our regulations are about not moving species across state borders for the point of introducing a species into a new place that will disadvantage agriculture, or moving endangered and highly threatened species across state boundaries because of the fauna acts and the regulations around them et cetera. Those sorts of things will eventually become barriers to effective management of the populations and the survival of the species in the future.
>
> … that is one example of where the regulations about how we have it currently set up will be quite a disadvantage to the idea that things will move on their own if they can, or might need to be

60 DSEWPAC, 'The National Reserve System (NRS) – Private landholders', < http://www.environment.gov.au/parks/nrs/getting-involved/private.html> viewed 15 January 2012.

61 Mr Leaman, DENR, *Transcript of evidence*, 17 May 2012, p. 9.

62 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 9.

> assisted to move if we think it is such a high priority that we want to do that.[63]

4.42 The Committee heard from some inquiry participants that it should not be assumed 'that most species can or will move along corridors in response to climate change'.[64] Mr Tim Low, an environmental consultant and science writer, in his submission, further argued that a focus on connectivity should not detract from the importance of isolated habitats serving as refugia, and that 'many species will benefit more from protection of these refugia than from increases in connectivity'.[65] It was further argued by the National Parks Association of Queensland and Mr Low, in their submissions, that there is little evidence to suggest widespread species migration in response to past climate changes so they cannot be expected to do so in future.[66]

4.43 According to the IUCN WCPA:

> … enhanced connectivity may also favour some native species perhaps to the detriment of other high conservation value species as well as favouring exotic invasive species, thus requiring more effort to control weeds and pests. The scale and pattern of connectivity must be tailored to the needs of priority species, considered on a bioregional basis.[67]

4.44 The Committee heard from some inquiry participants about the possibility that corridors will facilitate the movement of invasive species, especially those that benefit from an 'edge effect'.[68] Edge effects are the structural changes that occur at the points where contrasting land types or habitats meet. In a submission that the Invasive Species Council made on the draft National Wildlife Corridors Plan, it stated that:

> 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.

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63 Dr Craig James, Research Theme Leader, Managing Species and Natural Ecosystems, Commonwealth Scientific and Industrial Research Organisation, *Transcript of evidence*, 16 August 2012, p. 5.

64 See, for example, Mr Tim Low, *Submission 67*, p. [7].

65 Mr Tim Low, *Submission 67*, p. [7].

66 National Parks Association of Queensland Inc., *Submission 12*, p. [4]; Mr Tim Low, *Submission 67*, pp. [2], [7].

67 IUCN WCPA, *Submission 30*, p. 9.

68 Coast and Wetlands Society Inc., *Submission 51*, p. 3; National Parks Association of Queensland Inc., *Submission 12*, p. 4

> 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.
>
> Corridors should also be wide enough to prevent domination by problematic edge-favouring animals, whether exotic or native.[69]

4.45 The Invasive Species Council also further stated that the difficulties and costs of fire and invasive species management 'will be considerably greater in corridors due to their high edge to core ratios'.[70] It was concerned that funding for invasive species management in corridors would be contingent on grants that are not renewed, stating that 'the plan should place more emphasis on invasive species as management problems associated with corridor development'.[71] The Hon. Bob Debus, Chair of the NWCP Advisory Group, told the Committee that 'the control of invasive plants and animals ought to be an essential component of the design of any corridor'.[72]

4.46 The Committee heard that 'corridors can be ideal habitat for some invasive species where they benefit from an edge effect'.[73] Mr Dunn of the GER Initiative also described how to limit that possibility by creating an environment that is not ideal for many invasive species, which can be achieved by building on national parks to create a gradual shift in vegetation into productive areas with a 'patchwork' effect.[74] This system of protecting remnant areas, or a patchwork of refuges for different species, can help land management and farm productivity.[75]

4.47 The management of invasive species and fire patterns is increasingly important in an unpredictable climate. Effective management of invasive species, such as phytophthora dieback, will assist with the success of connectivity attempts between ecosystems.[76]

4.48 The Committee heard of the need to have a quantitative understanding of the resources being managed, the need to measure and understand

69 Invasive Species Council, *Corridor risk assessment needed: A submission about the draft National Wildlife Corridors Plan*, Fairfield, Victoria, April 2012, p. 8.

70 Invasive Species Council, *Corridor risk assessment needed: A submission about the draft National Wildlife Corridors Plan*, Fairfield, Victoria, April 2012, p. 8.

71 Invasive Species Council, *Corridor risk assessment needed: A submission about the draft National Wildlife Corridors Plan*, Fairfield, Victoria, April 2012, p. 8.

72 The Hon. Bob Debus, NWCP Advisory Group, *Transcript of evidence*, 12 October 2012, p. 25.

73 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 12.

74 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 12.

75 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 12.

76 South Coast Natural Resource Management (South Coast NRM), *Submission 76*, p. [3]; Mr Tim Low, *Submission 67*, p. [8].

changes that occur to those resources, and the need to adapt and manage to deal with those changes.[77] The South Australian Government described the challenge as being to adopt a new model for the delivery of government programs, based on a comprehensive understanding of the resources in question.[78]

4.49 Ms Kate Andrews, Chair of Territory Natural Resource Management highlighted the need to manage for uncertainty and risk, and to put our best efforts into understanding the tipping points and thresholds within our system.[79] Representatives of the Western Australian Centre of Excellence for Climate Change, Woodland and Forest Health discussed the need to be innovative and use the resources, 'knowledge and remote sensing tools that we have to look at areas that are protectable from fragmentation, from drought, from phytophthora dieback'.[80] Professor Hardy, Director of the Centre, explained that these areas need to be maintained as intact ecosystems, linked through corridors with other ecosystems that need minimal input to try and keep them healthy.[81] Professor Dell, also of the Centre, stated that the focus should be on the ecosystems that are declining and approaching tipping points of no return.[82]

4.50 The Australian Marine Sciences Association stated that, similar to terrestrial environments, in an ocean environment it cannot always be assumed that migration to new habitats is possible.[83] The Committee heard from the ACRS that the boundaries of the MPAs may need to change as the climate changes, in order to provide stepping stones to enhance connectivity and migration.[84] ACRS also stated that little is known about inter-reefal areas, which are critical in the functioning of an ecosystem, except that much of the fauna is sedentary and cannot migrate in the face of increasing water temperatures.[85] ACRS explained the effects

77 Dr Graeme Worboys, Vice-Chair, Mountains and Connectivity Conservation, IUCN WCPA, *Transcript of evidence*, 2 March 2012, p. 2.

78 DENR, *Submission 80*, p. 3.

79 Ms Kate Andrews, Chair, Territory Natural Resource Management (Territory NRM), *Transcript of evidence*, 4 July 2012, pp. 7-8.

80 Professor Bernard Dell, Chief Investigator, and Professor Giles Hardy, Director, Western Australian Centre of Excellence for Climate Change, Woodland and Forest Health, *Transcript of evidence*, 7 November 2011, p. 40.

81 Professor Hardy, Western Australian Centre of Excellence for Climate Change, Woodland and Forest Health, *Transcript of evidence*, 7 November 2011, p. 40.

82 Professor Dell, Western Australian Centre of Excellence for Climate Change, Woodland and Forest Health, *Transcript of evidence*, 7 November 2011, p. 41

83 AMSA, *Submission 17*, p. 4.

84 ACRS, *Submission 63*, p. [8].

85 ACRS, *Submission 63*, p. [6].

of decreasing levels of aragonite saturation (the amount of carbonate in the seawater which enables organisms to build calcium carbonate). Aragonite saturation has 'dropped around the globe dramatically since pre-industrial times and will drop further as the carbon dioxide concentrations increase further'.[86]

4.51 Ms Andrews highlighted the need to invest in people in the long-term, in order that we have the human capacity to deal with issues relating to biodiversity and threats to biodiversity, including climate change.[87] The IUCN WCPA stated that policy must reflect this need for investment in capacity building for conservation management, including skills development for people working on IPAs, connectivity corridors, protected areas and other conservation lands.[88]

4.52 Monitoring the success and progress of the corridor is one of the key challenges for the GER Initiative, and it requires large investment.[89] Mr Dunn of the GER Initiative explained that:

> Corridors or connectivity conservation needs to increasingly become a filter for Caring for our Country and for the Biodiversity Fund. A gap at the moment is providing direction … at a continental scale as well as investing at a continental scale to look at monitoring, evaluation and building the science.[90]

Conclusions and recommendations

4.53 The Committee considers connectivity conservation initiatives, such as the National Wildlife Corridors Plan, as vital tools in addressing the effects that climate change will have on Australia's biodiversity. There is a strong opportunity for national leadership on connectivity conservation, with the Australian Government providing the framework and direction, then encouraging and allowing local implementation. The Committee notes that placing additional lands into reserves to form connectivity corridors is an important part of Australia's conservation effort and agrees with the general goal of establishing a single national reserve system to facilitate better integration of off-reserve conservation with protected areas, as outlined in the 2009 report on the vulnerability of Australia's biodiversity

86 ACRS, *Submission 63*, p. [6].

87 Ms Andrews, Territory NRM, *Transcript of evidence*, 4 July 2012, p. 9.

88 IUCN WCPA, *Submission 30*, p. 3.

89 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 13.

90 Mr Dunn, GER Initiative, *Transcript of evidence*, 2 March 2012, p. 14.

to climate change.[91] The Committee highlights the need to focus on proper, science-based and adequate management of corridors to prevent fire and invasive species risk.

4.54 The Committee recommends an overall approach which would:

- be strategic in managing for the unpredictable effects of climate change
- ensure the required research is undertaken into tipping points and system thresholds
- improve understanding in communities of connectivity conservation, through local education programs
- collect the information from evaluation and monitoring of connectivity conservation projects, including via citizen science projects
- aggregate, analyse and evaluate the data gathered against regional and national objectives
- provide long-term funding for ongoing environmental stewardship
- address barriers to take up of private land conservation initiatives.

4.55 A critical aspect of the continued development of the NRS is the need to focus on ecosystems in decline and those reaching the tipping point of no return. Research, planning, engagement, monitoring, evaluation, and storage of the evaluative data are key elements of an effective adaptive management approach to connectivity conservation projects that should be outlined by the Australian Government and promoted to the community at large.

4.56 While connectivity corridors can provide vital refugia and the ability for animals to move and adapt to different areas in the face of climate change, they can also allow ready transfer of feral pests and weeds to places they may not have otherwise had the chance to reach. Connectivity corridors may also present significant costs and planning challenges. The Committee agrees with the Invasive Species Council that ongoing funding for invasive species management, incorporated as part of the National Wildlife Corridors Plan, is important, and with the need to adequately address the management issues that threatening processes such as fire and invasive species pose.

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91 Biodiversity and Climate Change Expert Advisory Group, *Australia's biodiversity and climate change: A strategic assessment of the vulnerability of Australia's biodiversity to climate change – Summary for policy makers 2009*, Summary of a report to the Natural Resource Management Ministerial Council commissioned by the Australia Government, Department of Climate Change and Energy Efficiency, Canberra, 2009, p. 14.

Recommendation 3

4.57 **The Committee recommends that ongoing funding for threatening processes, including fire and invasive species management, be provided under the National Wildlife Corridors Plan.**

4.58 Private landowners participating in a corridor initiative or conservation program on their land may or may not have access to government assistance, and issues regarding land use in adjacent areas can have further financial impacts for governments and private landowners.

4.59 The Committee understands the critical importance of planning connectivity corridors in areas and situations in order to limit the possibility of the creation of unforeseen circumstances and problems, such as the facilitation of the spread of invasive species. Adaptive management principles must be in place to deal with such issues if they arise, and processes in place to protect adjacent landowners and, indeed, participating landowners, from suffering such problems.

4.60 Ongoing environmental stewardship and environmental endowment funding for private land conservation is important in order to provide the funds necessary to support these important connectivity conservation projects, and also in case of unforeseen circumstances.

4.61 As discussed above, the Committee understands that governance barriers to protecting Australia's biodiversity could impact upon the continued successful expansion of connectivity corridors. The Committee agrees that a consistent approach to connectivity conservation is required, with cooperation between jurisdictions to ensure that the required quality of management of connectivity conservation areas is upheld.

Recommendation 4

4.62 **The Committee recommends that national marine and terrestrial biodiversity corridors be included on the agenda of the Council of Australian Governments.**

4.63 Education and engagement of the community as a next step is vital in order to encourage the uptake of connectivity conservation projects. The Committee acknowledges the enthusiasm and persistence of Landcare groups, Greening Australia, regional NRM organisations, and local NRM groups. These groups, together with national parks staff and museums, are vital to convey to communities the importance of biodiversity and

connectivity conservation to our way of life, and help people understand their place within the environment and not as separate to it.

4.64 In the Committee's view, the Great Barrier Reef Marine Park Authority's Reef Guardian program may prove a successful template on which to base wider programs which inform and engage communities in connectivity conservation issues. The Committee considers that the program may translate well to other management authorities and ecosystem types, as well as to other reef ecosystems. The Committee would welcome a report on the viability of such programs in other terrestrial and marine environments, such as the Australian Alps.