Managing Australia's protected areas

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Key messages

- Australia's National Reserve System provides a 430 million ha foundation for biodiversity, representing a high proportion of Australia's ecosystems.
- Great progress has been made towards an effective National Reserve System, but work remains to be done before it will grow into a full network allowing species and ecosystems to move across landscapes and seascapes.
- Habitats must be connected in order for native species to persist, and 'connectivity conservation' emphasises management of the land through which plants and animals move around, whether or not the land is part of a formal reserve system.
- Off-reserve management complements the National Reserve System with approaches that include habitat corridors, enhancement of remnant bush, and coordinated management of larger tracts of private and public lands.

INTRODUCTION

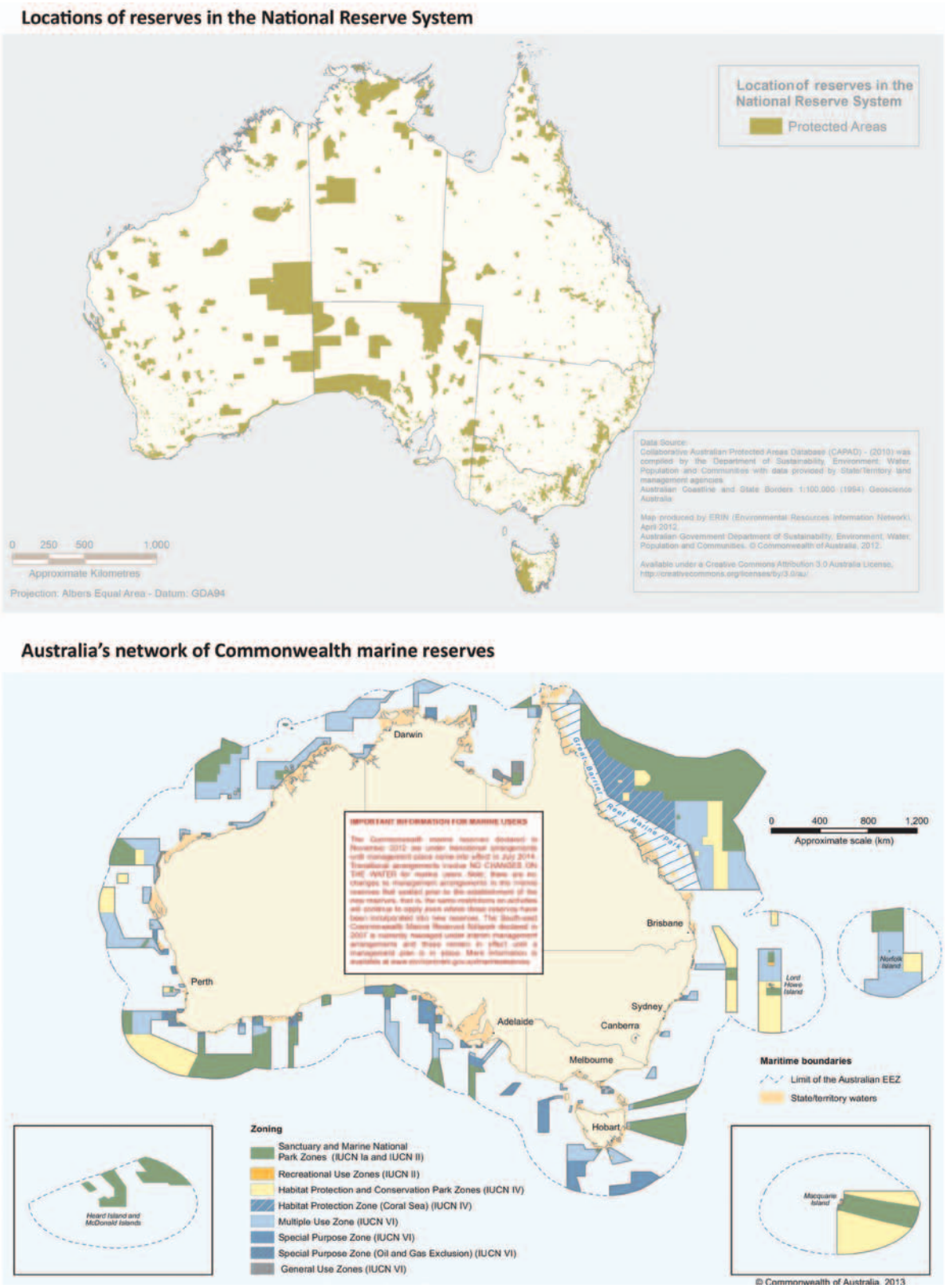
Australia is responding to the range of processes that are threatening the integrity of our ecosystems. In the previous chapter we saw an array of different measures that are being employed to manage threats to biodiversity and tools for planning and decision-making to get the best results for our investment. The focus of this chapter is on the backbone of these responses, the Australian protected area network. Australia appears to be well on the way towards achieving globally agreed targets under the Convention on Biological Diversity for the amount of our country covered by protected areas, being 17% of terrestrial ecosystems and inland waters, and 10% of coastal and marine areas, by 2020.[1]

Australia's primary instrument for the protected area network is the National Reserve System (Figure 5.1),[2] initiated after the 1992 Rio Earth Summit that led to the Convention on Biological Diversity.[3] Development of the National Reserve System is guided by a strategy aimed at protecting habitat so that ecosystems and species can persist with minimal management. It comprises both publicly and privately owned elements and is expected soon to cover 430 million ha of marine and terrestrial ecosystems. In public ownership, Australia has some 550 national parks and state conservation areas covering over 28 million ha[4,5] and 22 marine parks which, along with 48 marine reserves, constitutes the largest (310 million ha) marine reserve network in the world.[6] This chapter considers the achievements of and the future challenges to the National Reserve System and the wider protected area network.

THE NATIONAL RESERVE SYSTEM

The aim of the National Reserve System was first defined in 1993: 'to secure long-term protection for samples of all our diverse ecosystems and the plants and animals they support'.[3] This includes the National Representative System of Marine Protected Areas, which specifically aims 'to establish and manage a system of marine protected areas to contribute to the long-term ecological viability of marine and estuarine systems, to maintain ecological processes and systems'.[6] The National Reserve System is built around the bioregional framework outlined in Chapter 3. In addition to the 85 terrestrial bioregions are 60 Interim Marine and Coastal Regions on the Australian continental shelf, defined by physical surrogates such as seabed type, exposure to erosion, water depth, temperature and geomorphology.

Australia's National Reserve System includes over 550 national parks and state conservation areas, and comprises a spectacular array of landscapes and ecosystems.



▲ ***Figure 5.1****: The National Reserve System consists of nearly 10 000 protected areas, covering 117 million ha, or over 15% of the continent.[5] In the marine environment, the reserve system now covers 310 million ha or 36% of Commonwealth waters in 70 reserves; it is the largest network of marine reserves in the world.[6]*

Assessment and expansion of the National Reserve System is based upon three criteria known as 'CAR':[7]

- ***C****omprehensiveness* – the reserve system includes the full range of ecological (vegetation) communities
- ***A****dequacy* – reservation size is large enough to maintain species diversity, as well as ecological interactions and evolutionary processes
- ***R****epresentativeness* – reservation of each ecological community encompasses the diversity occurring within that community, including genetic diversity.

Any terrestrial or marine area can be part of the National Reserve System as long as it is designated a 'protected area'. Protected areas require legally binding mechanisms to ensure perpetual conservation; they must contribute to the CAR criteria and be managed to protect and maintain biological diversity either primarily or in combination with other uses, according to one of six categories developed by the International Union for the Conservation of Nature (categories I–IV are strictly protected and categories V–VI allow multi-use).[8] Multi-use protected areas make up more than a quarter of the National Reserve System. The majority of these parks and conservation areas are under state jurisdiction where access restrictions for multi-use can be relaxed (e.g. for logging, cattle grazing, and fishing).

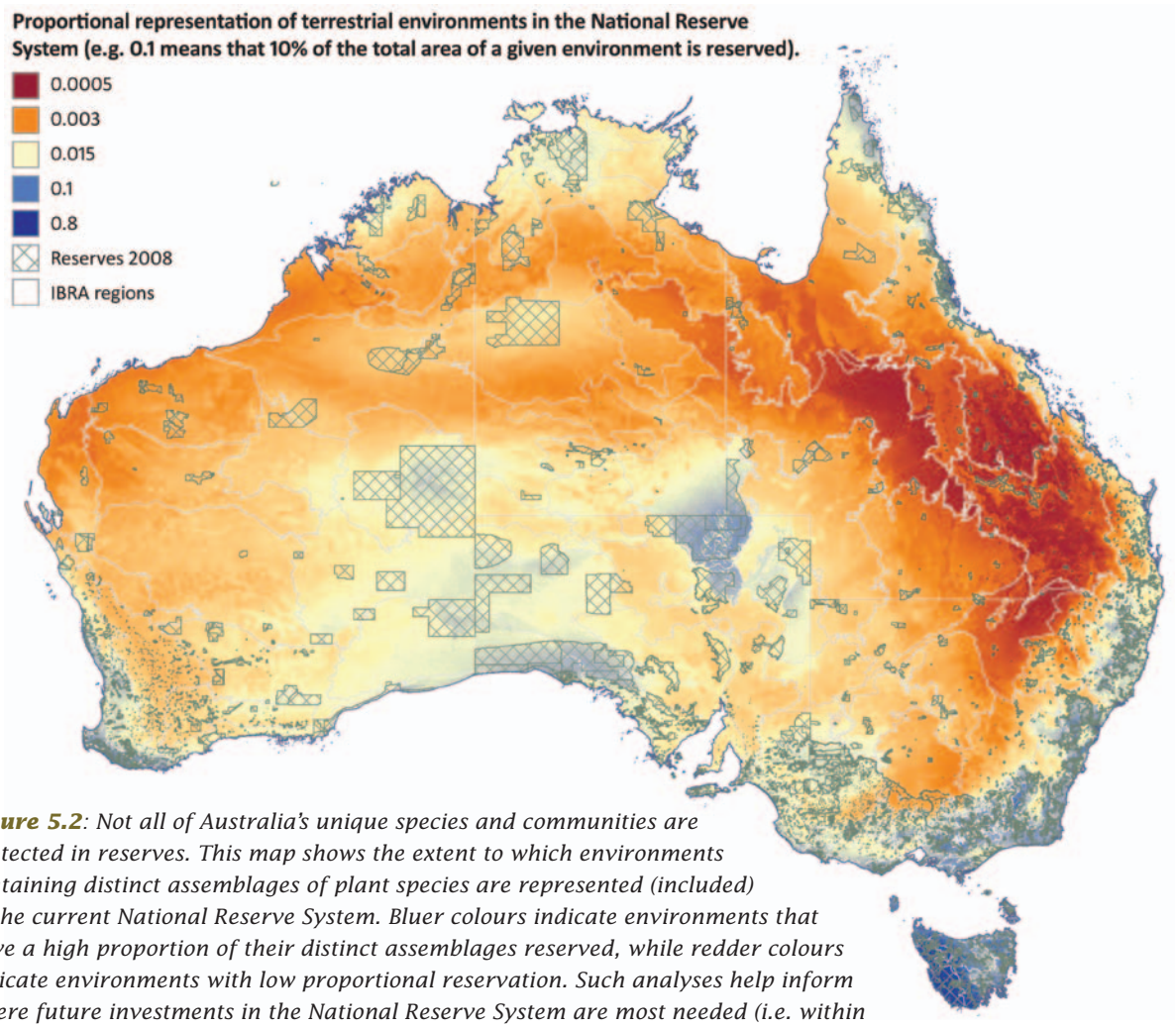
The National Reserve System includes private conservation reserves of 2 million ha. There are also 36 million ha in 53 Indigenous Protected Areas, with more under application, representing more than 30% of the land-based National Reserve System.[9] Similarly, non-government organisations, particularly the Australian Wildlife Conservancy, Bush Heritage Australia, the Nature Conservancy, the Trust for Nature and Birds Australia, also contribute by buying and managing land for conservation. The first three together have spent over $20 million and added 2 million ha to the National Reserve System over the past 20 years or so.

The view from Western Lookout, Cravens Peak Reserve, Queensland. The reserve is owned and managed for conservation by Bush Heritage Australia. Photo: Nella Lithgow, Bush Heritage Australia.

The performance of the National Reserve System has been reviewed against the targets for inclusion by 2030, by both the Department of the Environment and WWF-Australia. These targets are at least 80% of the regional ecosystems in each bioregion, 15% of the area of all extant ecosystems, and critical areas to ensure the viability, resilience and integrity of ecosystem function in response to a changing climate.[10] Combining these reviews, progress to date can be summarised as follows;

- The National Reserve System was nearly halfway towards 15% representation of habitat and species, and all but 2% of the gap could be met from existing, largely intact or remnant ecosystems.
- For comprehensiveness, five to 11 of 85 bioregions met the target.
- For adequacy, 49 bioregions had 10% area protected, and those that didn't still cover large connected areas of eastern and north-western Australia (Figure 5.3).[11,12]
- For representativeness, between 20 and 53 of the 403 sub-bioregions met the target.

The analysis by WWF-Australia concluded that progress has been made but that work remains to be done.[13] A recent assessment of marine elements of the National Reserve System found it not yet fully representative.[14]

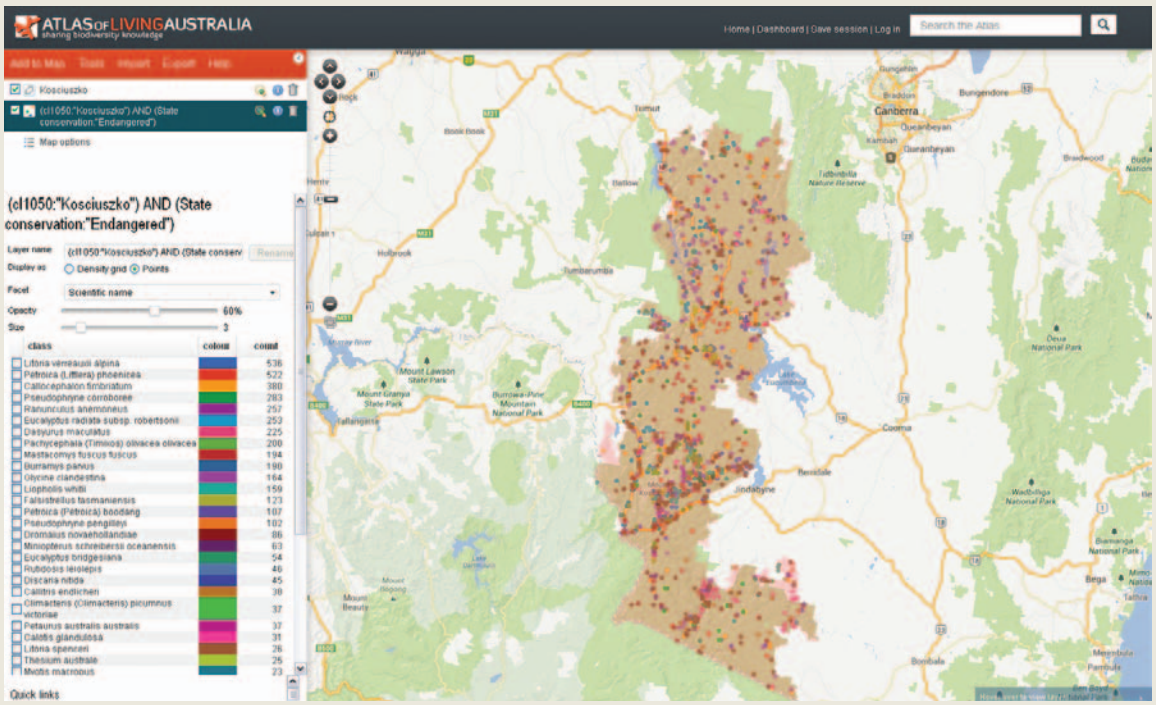


▲ ***Figure 5.2****: Not all of Australia's unique species and communities are protected in reserves. This map shows the extent to which environments containing distinct assemblages of plant species are represented (included) in the current National Reserve System. Bluer colours indicate environments that have a high proportion of their distinct assemblages reserved, while redder colours indicate environments with low proportional reservation. Such analyses help inform where future investments in the National Reserve System are most needed (i.e. within the redder areas) to ensure that the maximum number of unique species are protected.*[15]

Modelling and mapping of fine-scale patterns of biodiversity are enabling assessment of the representativeness of the National Reserve System with new rigour. The *Atlas of Living Australia* is assisting this process (Box 5.1).

Box 5.1: Designing better reserves using online data tools

Historically, it has not been easy to see how well the chosen elements of the National Reserve System match distributions of threatened and endangered species or their preferred habitats. The *Atlas of Living Australia*'s mapping and analysis tools now allow these sorts of analyses to be undertaken easily. The *Atlas* instantly accesses all available data repositories, including its own up-to-the-minute data for species observations, in order to create distribution maps for any Australian species. Using the mapping tool it can highlight conservation reserves, such as a national park (Figure 5.3). The *Atlas* can then produce a report on all threatened and endangered species in any area defined by the user, and show to what degree that reserve offers protection to endangered and threatened species known to occur in that region.



▲ ***Figure 5.3****: Screenshot showing endangered species in Kosciuszko National Park, with occurrence records filtered to show different coloured points for each species.*[16]

The National Reserve System also needs to take account of responses of biodiversity to times of stress. In extreme conditions, many plants and animals retract to refuges. As pressures increase, especially with climate change, such refuges will become the last stand for endangered species, so identifying and protecting them is critical for protected area networks. They may be easy to spot in areas of high local ecosystem diversity, for example in topographically varied escarpments where whole communities can do well. But in many cases refuges will be subtle or isolated, important for one or only a few species. Combining distribution modelling, satellite imagery and Indigenous knowledge will help predict their presence and assist management through incorporation into formal reserves or through off-reserve management (Figure 5.4).

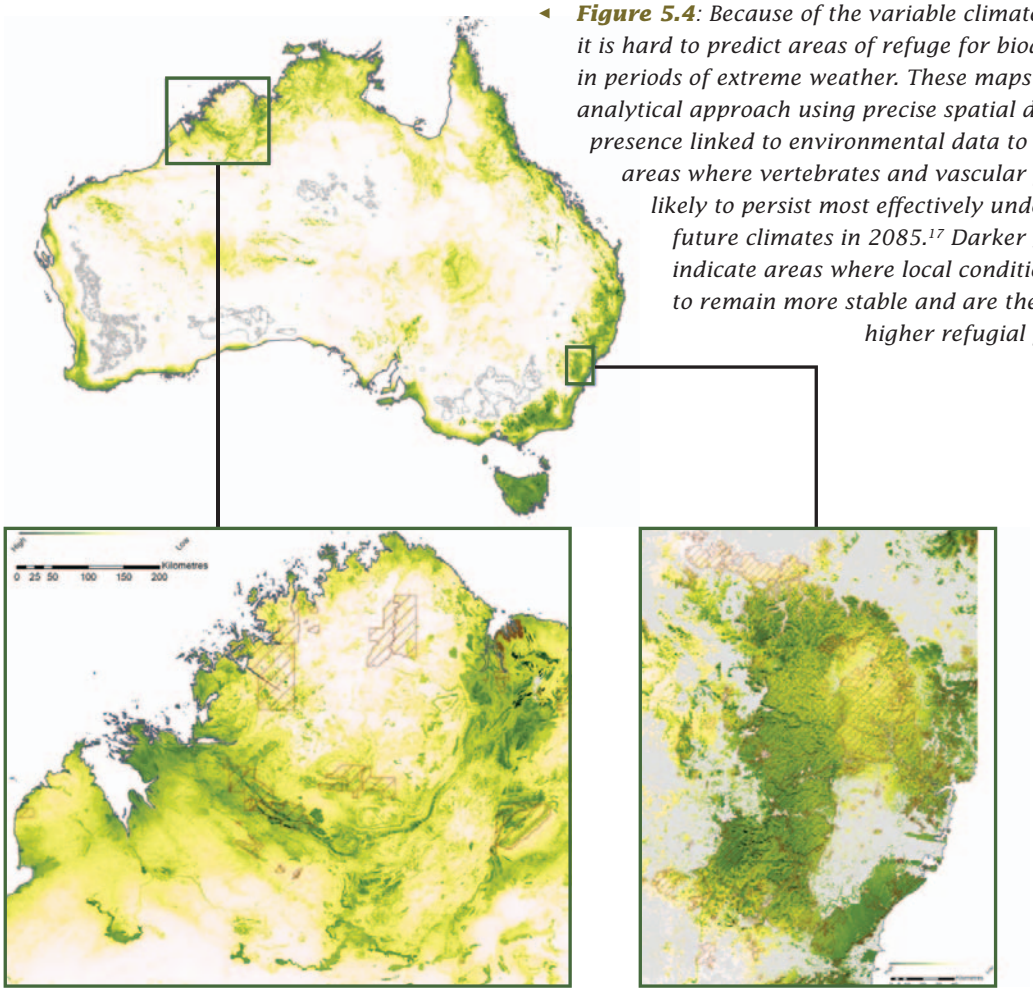


***Figure 5.4**: Because of the variable climate of Australia it is hard to predict areas of refuge for biodiversity in periods of extreme weather. These maps show an analytical approach using precise spatial data on species presence linked to environmental data to predict areas where vertebrates and vascular plants are likely to persist most effectively under projected future climates in 2085.[17] Darker greens indicate areas where local conditions are likely to remain more stable and are therefore of higher refugial potential.*

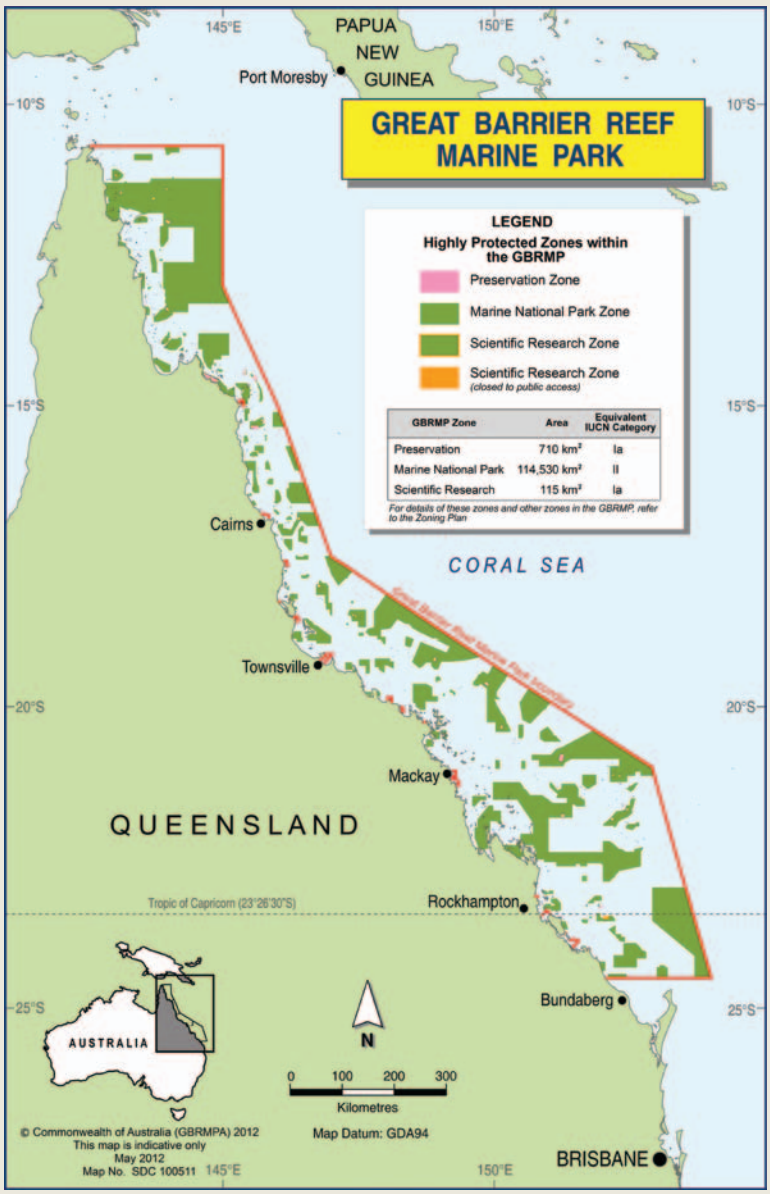
SYSTEMATIC CONSERVATION PLANNING

Systematic conservation planning aims to inform decision-making by identifying which areas of land and sea will preserve the most biodiversity for the least cost.[18] All available spatial data on species occurrence are overlayed with environmental information onto the areas already protected. This can identify new locations most likely to contain habitats not represented in any existing protected area. Using millions of records of more than 20 000 species of plants, vertebrates and invertebrates, together with remotely sensed environmental data, this analysis is being applied to predict how the representativeness and adequacy of the reserves might also be affected by future shifts in biodiversity composition under future climates (Figure 5.2).[19] Landscapes can then be 'designed' that should maximise the capacity of species to persist and adapt (Figure 5.4) through linking reserves, off-reserve conservation, environmental stewardship, and habitat restoration. With all available biodiversity data fully analysed, community-based decision-making approaches on reserve design noted in Chapter 4 and illustrated in Box 5.2 can be applied.

Systematic conservation planning is also used to identify optimal areas of private land for conservation covenants or carbon forestry, for example. In most cases alternative areas could be proposed, providing planners with needed flexibility when negotiating the design of reserves that will affect multiple interest groups. A principle of 'complementarity' can be applied, whereby areas are selected based on data analyses to protect the greatest possible range of unique and important biodiversity features for the least financial cost – say, five populations of each species and 10% of each ecosystem – rather than just selecting sites with the most species or ecosystems.[20]

Box 5.2: The Great Barrier Reef Marine Park: systematic conservation planning

In 2001 the Great Barrier Reef Marine Park Authority initiated a rezoning to protect biodiversity through 'No-Take Green Zones'. Planners were faced with a complex problem of selecting sites in view of many (often conflicting) views and objectives. Social and scientific committees were appointed to represent stakeholders, to analyse the socio-economic setting, and to establish political support for implementation. The conservation objectives were to represent at least 20% of each of 70 bioregions. The socio-economic objectives were to distribute negative effects equitably, such that 'everybody is only a little bit unhappy' (e.g. by maximising overlap between No-Take Zones and no-go areas of cultural significance), and to create reserve networks that are practical for users and managers. Draft plans were revised through expert input, public consultation and reanalysis. The decision model showed the consequences of different plans, and the committees negotiated to arrive at the final plan – a Marine Park that covers 33% of the region, making the largest single marine park in the world (Figure 5.5).[21]



▲ ***Figure 5.5****: The Great Barrier Reef Marine Park showing areas where fishing is prohibited (dark gray shading). Map courtesy of the Spatial Data Centre, Great Barrier Reef Marine Park Authority, © Commonwealth of Australia, 2013.*

OFF-RESERVE CONSERVATION THROUGH WHOLE-OF-LANDSCAPE MANAGEMENT

Off-reserve management is also important for ensuring that the protected areas of the National Reserve System provide for long-term conservation in the landscape. Off-reserve conservation areas on private land complement the National Reserve System, but have less stringent criteria for protection from clearing and management of pests and weeds.

As over 60% of Australia is in private tenure, mechanisms for conservation on private lands (Table 5.1) are vital to the success of the National Reserve System in helping conserve species and ecosystems. Land-stewardship programs create markets to pay land-owners to enter agreements for protecting remnant ecosystems and managing threatening processes such as fire, grazing, weeds and feral animals. Grant schemes aim to develop environmental markets that encompass biodiversity benefits – for example, carbon storage and environmental flows of water – through management and restoration of land.[22] Off-reserve marine conservation areas are massive by comparison to those in the terrestrial National Reserve System. Closures to commercial fishing designated by state and Commonwealth fisheries management authorities have been larger than formal Marine Reserves on the continental shelf. Many such areas are designated as multi-use however and can be reopened for fishing or used at some future point to extract natural resources.

Table 5.1: Mechanisms and instruments for conservation on private lands

Type	Objective	Land manager	Duration
Protected areas included in the National Reserve System			
Privately owned reserves	Land and sea biodiversity conservation and may be multi-use	NGOs and other private owners	In perpetuity
Indigenous protected areas	Land and sea biodiversity conservation and may be multi-use	Indigenous owners	In perpetuity
Land conservation covenants	Nature refuges and restricting land use	Non-government organisations, freeholders	In perpetuity
Off-reserve conservation areas			
Grant schemes and auctions	Biodiversity restoration	All	Ongoing
Voluntary agreements for land management partnerships	Duty of care to biodiversity	All	Ongoing
Informal voluntary protection of habitat	Undocumented	All	Ongoing
Environmental stewardship incentives	Biodiversity management of land and duty of care	Farmers	Ongoing
Industry standards	Wildlife management on land and sea	Industry	Ongoing
Offsets or 'BioBanking' (see Chapter 11)	Land and sea biodiversity conservation	Industry and local government (e.g. mining and urban development) – off or on multi-use protected areas	Duration of impact

Many reserve design approaches worldwide are adopting 'connectivity conservation'.[23] Connectivity conservation emphasises connections between habitats across the landscape, aiming to allow movement of plants and animals through a region regardless of whether or not land is part of a formal reserve system (see also Chapter 7). The approaches include habitat corridors, enhancing the size and condition of remnant bush, and coordinated management of larger tracts of private and public lands. Connectivity is also fundamental to marine reserves, where establishing networks of protected areas as 'stepping stones' to aid species to persist and adapt to change is widely accepted. Implementation of such approaches is the focus of several government initiatives.

Connectivity allows species such as this sugar glider, Petaurus breviceps*, to move across the landscape, helping them adapt to change. Photo: Eric Vanderduys, CSIRO.*

While the ideas of connectivity may seem to be common sense, key questions remain around its benefits:[23]

- What types of habitat linkage will favour movement of desirable species?
- What are the relative benefits of connected corridors, as opposed to increasing the area of habitat in a landscape regardless of connections?
- Will connectivity encourage the migration of native species while at the same time ensuring containment of invasive non-natives?
- When will connectivity generate relatively low conservation benefits compared to other potential actions?

In many areas, particularly in the face of climate change, it will be just as important to maximise the size and coverage of individual reserves as to build connectivity.

CONCLUSION

Sustaining Australia's biodiversity across a network of protected areas, complemented by whole-of-landscape conservation management, is among our greatest environmental challenges. An excellent start has been made on the National Reserve System, and on the necessary management to create networks between reserves across the landscape.

FURTHER READING

Dunlop M, Hilbert DW, Stafford Smith M, Davies R, James CD *et al.* (2012) *Implications for Policymakers: Climate Change, Biodiversity Conservation and the National Reserve System.* CSIRO Climate Adaptation Flagship, Canberra. <http://www.csiro.au/Organisation-Structure/Flagships/Climate-Adaptation-Flagship/adapt-national-reserve-system.aspx>.

Williams KJ, Ferrier S, Rosauer D, Yeates D, Manion G *et al.* (2010) *Harnessing Continent-wide Biodiversity Datasets for Prioritising National Conservation Investment.* CSIRO Ecosystem Sciences, Canberra.