An Extraordinary Natural Legacy

An assessment and recommendations for the proposed expansion of Western Australia's conservation reserve system

Summary Report

Centre for Conservation Geography

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Acknowledgement of country: The authors acknowledge the Traditional Owners of the lands that are the focus of this report and their continuing connection to these lands. We pay respect to them and their cultures, and to their elders past and present. We acknowledge the inextricable link between natural values and Aboriginal heritage values and that the knowledge of Traditional Owners will be vital for maintaining both.

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Cover photo: 'An ancient landscape' by Hugh Brown.
Image taken in the vicinity of ex Hamersley, one of the focus areas of this report.

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SUMMARY

The significance of the proposed parks

Western Australia's first national park (known now as the John Forrest National Park) was created almost 120 years ago for recreation. Since then, the goals for parks have multiplied due to realisation of their many economic,social, cultural and environmental benefits. They are intended to protect representative portions of each ecosystem and provide sanctuary for threatened species, conserve the cultural heritage of past Indigenous and pastoral inhabitants, support Traditional Owners to maintain their culture and connections to country, provide exciting new places for Western Australians to visit, and expand tourism and economic opportunities.

One far-sighted project that will enable Western Australia to make major progress in meeting these multiple goals was begun more than 20 years ago, when the government started strategically acquiring leasehold properties in regions with few existing reserves, with funding help from the federal government. Many were bought as part of the Gascoyne-Murchison Strategy, initiated in response to the collapse of the wool industry.

However, the transfer of most of these properties to the conservation reserve system has not yet occurred and they remain classified as unallocated Crown land. This tenure provides much weaker legal protections for natural and cultural values than would apply if they were conservation reserves.

The next step for the government, with the consent and involvement of Traditional Owners, is to formally gazette them as reserves (national parks, nature reserves or conservation parks) based on assessments of their natural and cultural values.

This report has been commissioned by The Pew Charitable Trusts to assist in the next phase of decision-making. It provides an assessment of the natural values of 63 properties and their potential contributions to Western Australia's conservation reserve system, and recommends how these values can most appropriately be protected in reserves.

The 63 properties assessed in this report have been grouped into 24 proposed new parks or expansions of existing parks, in 7 geographical clusters (Table 1, Figure 1).

The main values of focus include threatened and priority species and ecological communities, world heritage listings, important wetlands and other aquatic features, key biodiversity areas, plant communities and ecosystems lacking adequate protection in existing reserves and buffering of and connectivity with other reserves and high-value features. We also assess the extent to which the proposed parks will enable Western Australia to make progress on meeting an international benchmark for bioregional protection and a national target for ecosystem protection, thus enabling the state to move towards its overall goal of establishing 'a system of comprehensive, adequate and representative conservation reserves'.

Besides the natural values, there are other considerations for the government in deciding the future of these properties. These include the native title status and Indigenous heritage values of each property, which are mostly very high. We only briefly cover these values, for they require specific expertise. Considerations also include mining rights where leases or licences have been granted. We document the current extent of mining activities and make recommendations for future management.

Protecting ex Giralia (shown in the foreground) as a national park is important for the health of Exmouth Gulf (in the background), one of Australia's most significant coastal environments, bordering the Ningaloo Coast World Heritage Area. Photo: Renae Boyd

The slate rock that dominates much of the landscape of the proposed 'Wanna' Conservation Park is strikingly reflected here in Pretty Pool.
Photo: Samille Mitchell (DEC)

The proposed parks cover 4.97 million hectares, close to 2% of the state's total land area. Their gazettal as national parks, conservation parks or nature reserves would expand Western Australia's conservation reserve system from 7.6% of the state (19.4 million hectares) to 9.5% (24.4 million hectares). This would represent the single greatest expansion of Western Australia's terrestrial parks network.

The proposed parks harbour a substantial number of Western Australia's threatened and priority species – 76 animal and 279 plant species. Despite making up less than 2% of the state's land area, the parks would help protect about a quarter of the state's threatened and priority vertebrate animal species (excluding marine species). These include a sixth of the state's threatened and priority mammals – bilbies and northern quolls among them – and close to half the threatened and priority birds, including the night parrot, malleefowl and declining shorebirds such as the eastern curlew. The proposed parks also harbour almost 8% of the state's threatened and priority plant species. For many of these plants, the parks would provide the first formal protection of their habitat.

Thirty-four threatened and priority ecological communities – more than 7% of Western Australia's total – would be protected, most for the first time and many in their entirety. Most are listed priority-1 communities with very restricted distributions and no existing protection in reserves. They include calcrete groundwater communities with unique stygofauna, and plant communities associated with banded ironstone formations that often include rare and endemic species. Both types of communities are threatened by mining.

The proposed parks would boost protection of 5 wetlands listed by the Australian government as nationally important, all significant for waterbirds or shorebirds. Other sites recognised as nationally or internationally significant include 2 proposed parks overlapping the Shark Bay World Heritage Area, 14 proposed parks lying within national biodiversity hotspots and 3 sites designated by Birdlife International as key biodiversity areas because of their importance for birds.

Table 1: Proposed new and expanded parks for Western Australia

Property	Recommended Protection	Size (hectares)
Shark Bay World Heritage to Wooleen		
ex Carrarang	'Carrarang' (Edel Land) National Park (Class A)	19,000
ex Yaringa, ex Nanga (north)	'Yaringa – Nanga' National Park (Class A)	108,000
ex Nanga (south), ex Nerren Nerren, ex Murchison House (north), ex Tamala	Zuytdorp Nature Reserve (expansion) (Class A)	286,000
ex Murchison House (south)	Kalbarri National Park (expansion) (Class A)	9,000
ex Muggon, ex Wooleen	'Muggon – Wooleen' Conservation Park (Class A)	192,000
Ningaloo to Exmouth Gulf		
ex Boologooro	'Boologooro' Nature Reserve (Class A)	15,000
ex Giralia	'Giralia' National Park (Class A)	232,000
Kennedy Range Country		
ex Bidgemia, ex Doorawarrah, ex Minnie Creek, ex Jimba Jimba, ex Lyons River, ex Mooka, ex Mardathuna, ex Middalya, ex Williambury	Kennedy Range National Park (expansion) (Class A)	193,000
ex Pimbee	'Pimbee' Conservation Park (Class A)	99,000
Pilbara Biodiversity Hotspot		
ex Hamersley, ex Hillside, ex Juna Downs, ex Roy Hill, ex Mt Florence, ex Rocklea, ex Mulga Downs, ex Marillana	Karijini National Park (expansion) (Class A)	301,000
ex Meentheena	'Meentheena' National Park (Class A)	217,000
ex Mt Minnie, ex Nanutarra	Cane River Conservation Park (expansion) (Class A)	180,000
ex Karratha, ex Mardie	'Karratha – Mardie' National Park (Class A)	18,000
ex Pyramid	Millstream Chichester National Park (expansion) (Class A)	3,000
Murchison Salt Lake Circuit		
ex Cashmere Downs, ex Bulga Downs (west), ex Bulga Downs (east)	'Cashmere – Bulga' National Park (Class A)	165,000
ex Black Range, ex Kaluwiri, ex Lake Mason	'Black Range – Kaluwiri' National Park (Class A)	332,000
Tallering Botanical Trail		
ex Kadji Kadji, ex Burnerbinmah, ex Karara, ex Lochada, ex Thundelarra, ex Warriedar	'Kadji Kadji – Burnerbinmah' National Park (Class A)	533,000
ex Barnong	'Barnong' National Park (Class A)	168,000
ex Woolgorong	'Woolgorong' Conservation Park (Class A)	116,000
Mid West Mulga Country		
ex Twin Peaks, ex Narloo, ex Yuin	'Twin Peaks – Yuin' Conservation Park (Class A)	102,000
ex Noongal, ex Dalgaranga, ex Lakeside	'Noongal – Lakeside' National Park (Class A)	202,000
ex Doolgunna, ex Mooloogool	'Doolgunna – Mooloogool' National Park (Class A)	591,000
ex Cobra, ex Dalgety Downs, ex Waldburg, ex Narloo, ex Mt Phillip	Mount Augustus National Park (expansion) (Class A)	604,000
ex Wanna	'Wanna' Conservation Park (Class A)	289,000
TOTAL	24 reserves	4,974,000

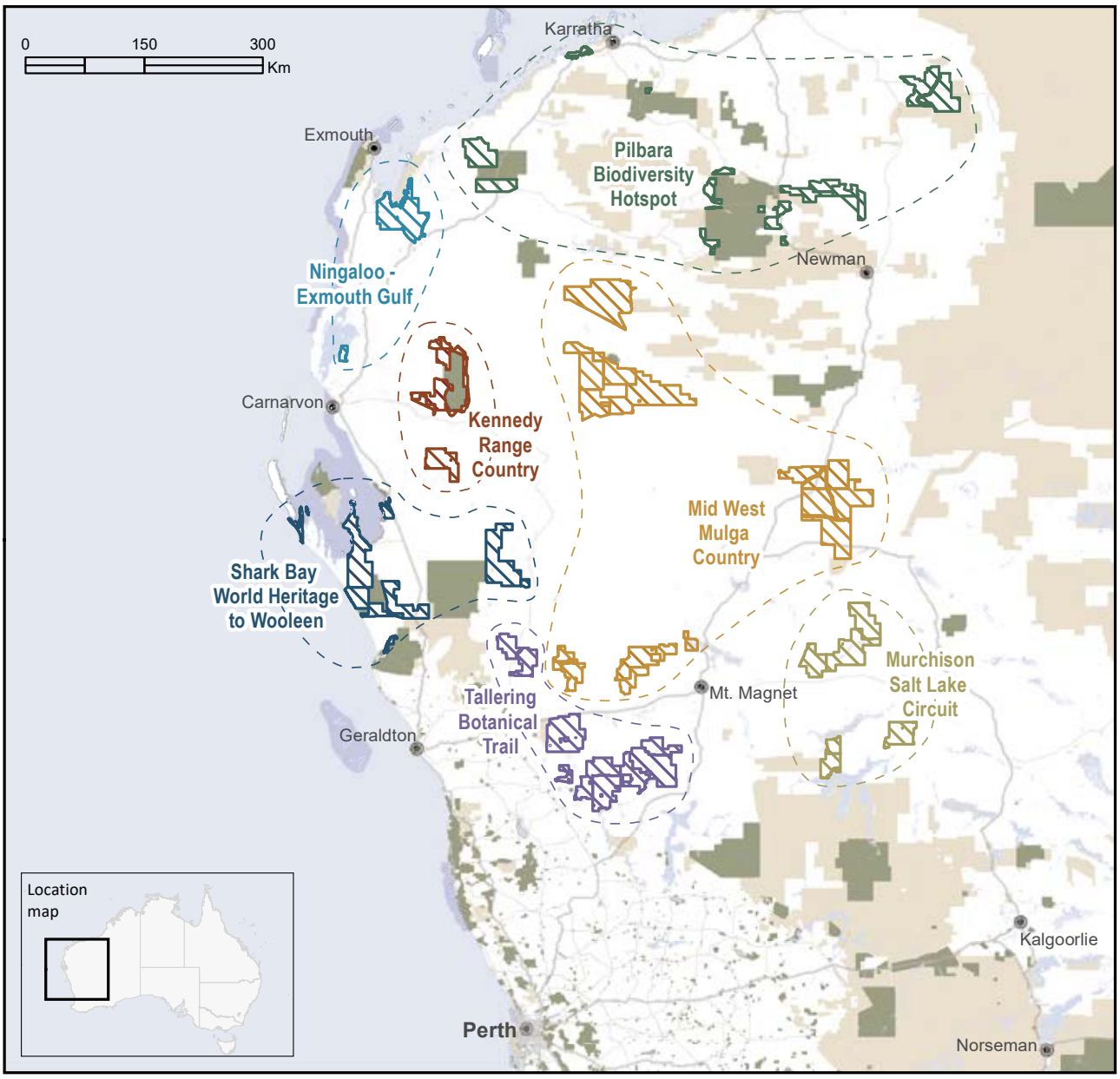


Figure 1: The proposed parks assessed in this report and the property 'clusters' which structure the assessment and form the basis of the main report's chapters.

This landscape, dominated by mulga, is typical of the Mid West. Photo: Simon Nevill

Some proposed parks are outstandingly rich in certain groups of organisms – lizards and stygofauna in the Pilbara Biodiversity Hotspot, plants in the Tallering Botanical Trail and Shark Bay World Heritage to Wooleen clusters, shorebirds in the Ningaloo to Exmouth Gulf cluster, and stygofauna in the Murchison Salt Lake Circuit.

As one indication of the diversity of habitats that would be protected, the proposed parks encompass parts of 216 sub-bioregional ecosystems. More than half (57%) would receive their first protection in the state's reserve system and three-quarters currently have less than 5% of their extent protected in reserves.

Although not a primary focus in this report, the proposed parks also have outstanding cultural significance. They would protect 270 registered Aboriginal heritage sites as well as many more significant sites not yet registered or lodged.

In combination, the proposed parks would enable Western Australia to make substantial progress towards its major conservation goal of a comprehensive, adequate and representative reserve system. Progress has been assessed in this report in 2 ways – the extent to which the parks enable Western Australia to meet (a) a 2020 international benchmark (17%) for protection of bioregions and sub-bioregions and (b) a national minimum target (15%) for protection of ecosystems. The state still has a considerable way to go to meet these targets – about half of Western Australia's bioregions do not meet the 17% benchmark and more than 40% of the state's ecosystems lack the targeted 15% level of protection.

Most of the proposed parks are in bioregions with highly inadequate protection, among the lowest in Australia. The Gascoyne and Murchison bioregions have less than 2% of their extent in the conservation reserve system and 10 sub-bioregions have less than 5% in the reserve system (Figure 2).

Gazetting the proposed parks would enable Western Australia to achieve the international benchmark of 17% for 2 bioregions (Geraldston Sandplains and Yalgoo) and 2 sub-bioregions (Tallering and Geraldton Hills) and exceed 10% protection for an additional 2 bioregions and 4 sub-bioregions (Figure 2). The parks would more than triple protection for the poorly conserved Gascoyne and Murchison bioregions and 6 sub-bioregions.

At the ecosystem level, the proposed parks would enable Western Australia to meet the 15% minimum target for 73 sub-bioregional ecosystems. For 16 ecosystems with at least 85% of their extent on the properties, there is no other way of achieving the target.

We recommend in this report that the majority of proposed parks (16 of 24) be gazetted as national parks or added to existing national parks in recognition of their nationally significant values; 2 are recommended as nature reserves, and 6 with values of regional significance are recommended as conservation parks (Table 1). Their values should be further investigated and tenures revised if justified by new information.

The cliffs of ex Carrarang, the westerly-most point of the Australian mainland, are a highlight of the proposed new 'Carrarang' (Edel Land) National Park. Photo: Glenn Campbell

We strongly recommend that all proposed parks be classified as Class A. This is in recognition not only of their high values, but that they occur in sub-bioregions and bioregions with highly inadequate levels of protection. They were bought mainly for this reason, and represent a rare, not easily repeated, opportunity to fill major gaps in Western Australia's conservation reserve system. The Western Australian government will find it very difficult to make progress on meeting its conservation targets unless these properties are securely protected.

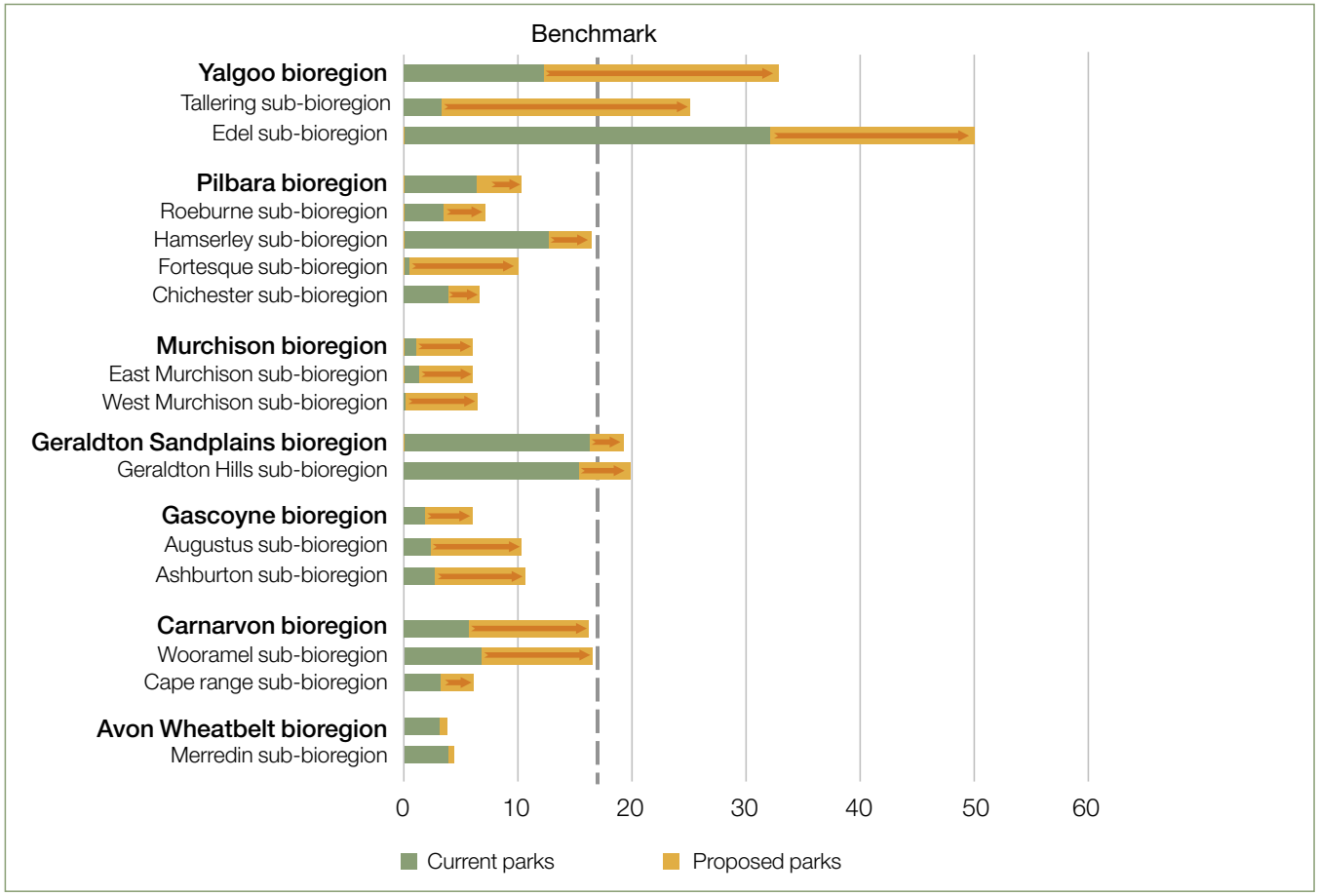
While the majority of the proposed parks are free of existing mining-related activities, the long delay in gazetting these properties – 20 years in some cases – means that some have already been subjected to considerable mining activity. Of 665 current mining tenements, 503 (76%) have been granted since the properties were bought for the purposes of conservation.

Applications for exporation have been made over 17 proposed parks and, if granted, would affect at least 10% of 10 proposed parks. Applications for mineral production have been made over parts of 2 proposed parks.

Our recommendations for managing mining-related activities are informed by what is needed to maintain the properties' natural values and by what is possible under Western Australian laws. Higher standards of assessment and management are required for conservation reserves, so most existing activities, as well as proposed activities, would need to be reviewed. Where such activities are clearly incompatible with maintaining natual values, we recommend, in the public interest, that approval not be granted. In a few cases, we recommend negotiations to seek alternative arrangements or excision of existing mining operations from future parks.

The assessments of each of the 24 proposed parks, summarised in the following sections, make clear that individually and collectively they would make a highly significant, mostly irreplaceable, contribution to Western Australia's conservation reserve system. If securely protected, they would indeed be an extraordinary natural legacy for Western Australia.

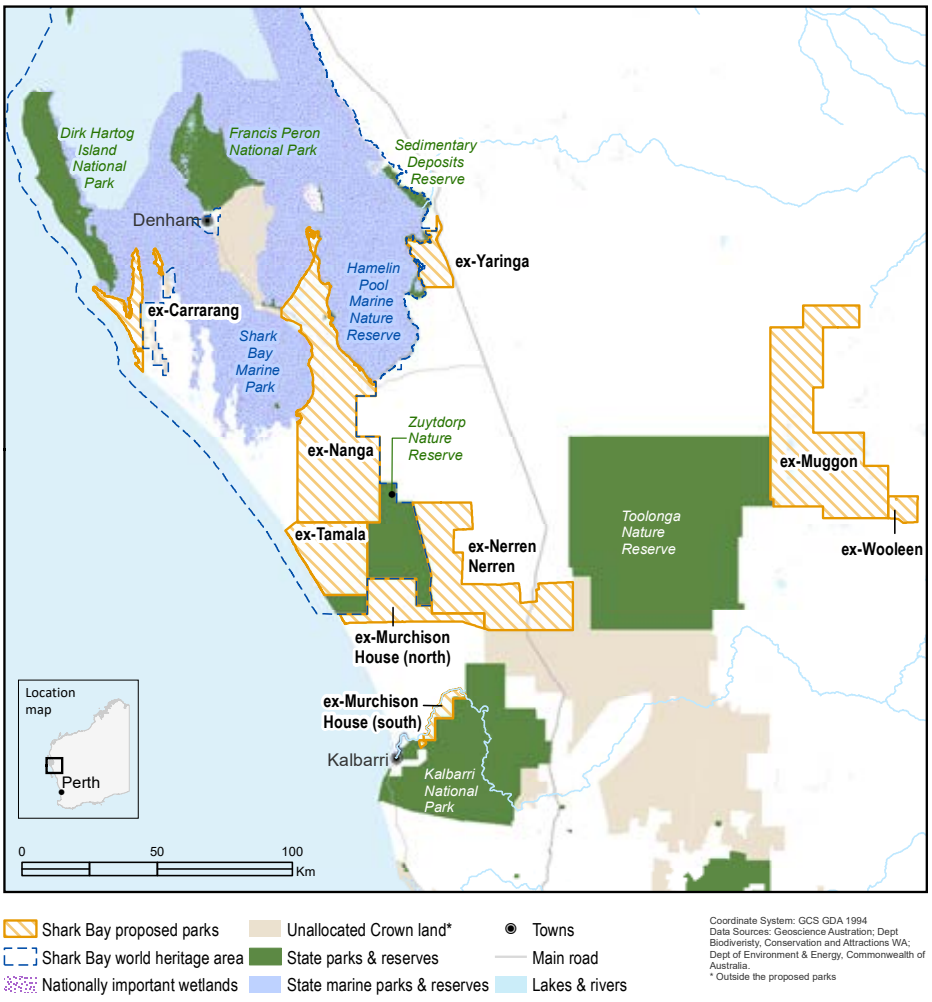
Figure 2: Progress towards the 2020 international benchmark for protection of bioregions and sub-bioregions (17%) due to gazettal of the proposed parks



Shark Bay World Heritage to Wooleen

As recognised by its world heritage status, the Shark Bay area has outstanding natural values. Lying in a transition zone between the eucalypt-dominated South West botanical province and the wattle-dominated arid province, the Shark Bay area has outstanding botanical diversity and endemism. It is also rich in animal species.

Another major conservation opportunity is to create a large (1.2 million hectares) land-to-sea corridor stretching from the Shark Bay peninsula to Kalbarri and 200–300 kilometres inland. The consolidation of fragmented existing reserves will increase their integrity, facilitate management of threats to both land and sea, and increase the tourism appeal of the area.



Natural highlights

1.2 million-hectare ocean-to-outback corridor

114 threatened and priority species including the endangered loggerhead turtle

Outstanding natural beauty – coastal cliffs, shell beaches, wildflower displays

10 plant communities and 29 sub-bioregional ecosystems not protected in existing reserves

World heritage values; greater protection for globally significant stromatolites

Botanical transition zone with very high plant diversity & endemism

Figure 3: The proposed parks of 'Shark Bay World Heritage to Wooleen'

Proposed Park	Properties	Size (hectares)	Traditional Owners (native title parties)
'Carrarang' National Park (Class A)	ex Carrarang	19,000	Malgana
'Yaringa – Nanga' National Park (Class A)	ex Yaringa, ex Nanga (north)	107,000	Malgana
Expansion of Zuytdorp Nature Reserve (Class A)	ex Tamala, ex Murchison House (north), ex Nerren Nerren, ex Nanga (south)	286,000	Nanda
Expansion of Kalbarri National Park (Class A)	ex Murchison House (south)	9,000	Nanda
'Muggon – Wooleen' Conservation Park	ex Muggon, ex Wooleen	192,000	Wajarri Yamatji

The proposed expansion of conservation reserves at world-heritage-listed Shark Bay would help create a 1.2-million-hectare 'Oceans to Outback' corridor stretching from the Shark Bay peninsula to Kalbarri National Park and 200–300 kilometres inland. Photo: Jake Masson

Proposed 'Carrarang' (Edel Land) National Park

Located on the tip of Shark Bay's southern peninsula, ex Carrarang features coastal dunes and a mix of spinifex grasslands and dwarf shrublands. It is part of the Shark Bay World Heritage Area with outstanding values including its high quality scenery of dramatic coastal cliffs and impressive wildflower displays. The proposed park would protect the following:

- a nesting site for 1 of the world's largest nesting populations of the nationally endangered loggerhead turtle
- 11 threatened and priority animal species – including the Shark Bay boodie, greater stick-nest rat and Shark Bay worm-lizard – and 11 threatened and priority plant species.

Proposed 'Yaringa – Nanga' National Park

The values of this proposed park, which lies within the Shark Bay World Heritage Area and encompasses some 60–70% of the coastline around Hamelin Pool, include the beauty of expansive shell beaches and wildflower displays, globally threatened species and the floral riches of the botanical transition zone. It features diverse shrublands with tree-heath and scrub-heath that includes banksias, grevilleas, wattles, paperbarks and mallees. The proposed park would protect the following:

- the globally significant stromatolites of Hamelin Pool (by providing a buffer), one of the main values for which the world heritage area was declared
- 22 threatened and priority plant species, including the endangered Beard's mallee, and 11 threatened and priority animal species, including the curlew sandpiper, greater sand plover and malleefowl (all vulnerable).

Proposed expansion of Zuytdorp Nature Reserve

Bordering the world heritage area, this proposed expansion of Zuytdorp features shrublands with scattered eucalypts, coastal heaths, shrub-heaths and tree-heaths. Shark Bay's tree-heaths are rich, complex communities unique to the area, with many endemic plants. The botanical richness is enhanced by it being part of the transition zone between the South West and Eremaean botanical provinces. The proposed expansion would protect the following:

- 47 threatened and priority plant species (15% not yet described), including Beard's mallee and 3 spider orchids, *Caladenia elegans, C. barbarella* and *C. bryceana* subsp. *cracens*, all endangered or critically endangered
- 8 threatened and priority animal species, including the malleefowl (vulnerable) and javelin legless lizard (priority 1)
- 15 plant communities (2 with no protection in existing reserves) and 18 sub-bioregional ecosystems (5 with no existing protection).

Proposed expansion of Kalbarri National Park

This property would extend the national park to include an additional 30 kilometers of the lower reaches of the Murchison River, where lie many freshwater springs and soaks. It features mostly low sheoak woodlands and shrublands of scrub-heath, wattles and paperbarks. The proposed expansion would protect the following:

- 19 threatened and priority plant species, including the endangered spider orchid *Caladenia bryceana* subsp. *cracens* and Kalbarri leschenaultia, and the vulnerable long-leaved myrtle (H*ypocalymma longifolium)* known only from this property
- 6 threatened and priority animal species, including the golden gudgeon, a fish found only in the rocky pools of the Gascoyne and Murchison rivers, Carnaby's cockatoo (endangered) and malleefowl (vulnerable).

Proposed 'Muggon – Wooleen' Conservation Park

This proposed park has a diverse arid landscape with gently undulating to almost flat sandplains, stony spinifex ridge lands and numerous salt pans, claypans, seasonal saline marshes and seasonal saline lakes. Little is known about the wetlands but they are likely to teem with waterbirds when they fill. This proposed park would protect the following:

- Muggon Lake (saline), Mungawolagudgi Claypan (freshwater) and other wetlands likely to be ecologically important
- 10 priority plant species and 7 threatened and priority bird species, including malleefowl
- 16 plant communities (8 with no protection in existing reserves) and 18 sub-bioregional ecosystems (14 with no existing protection).

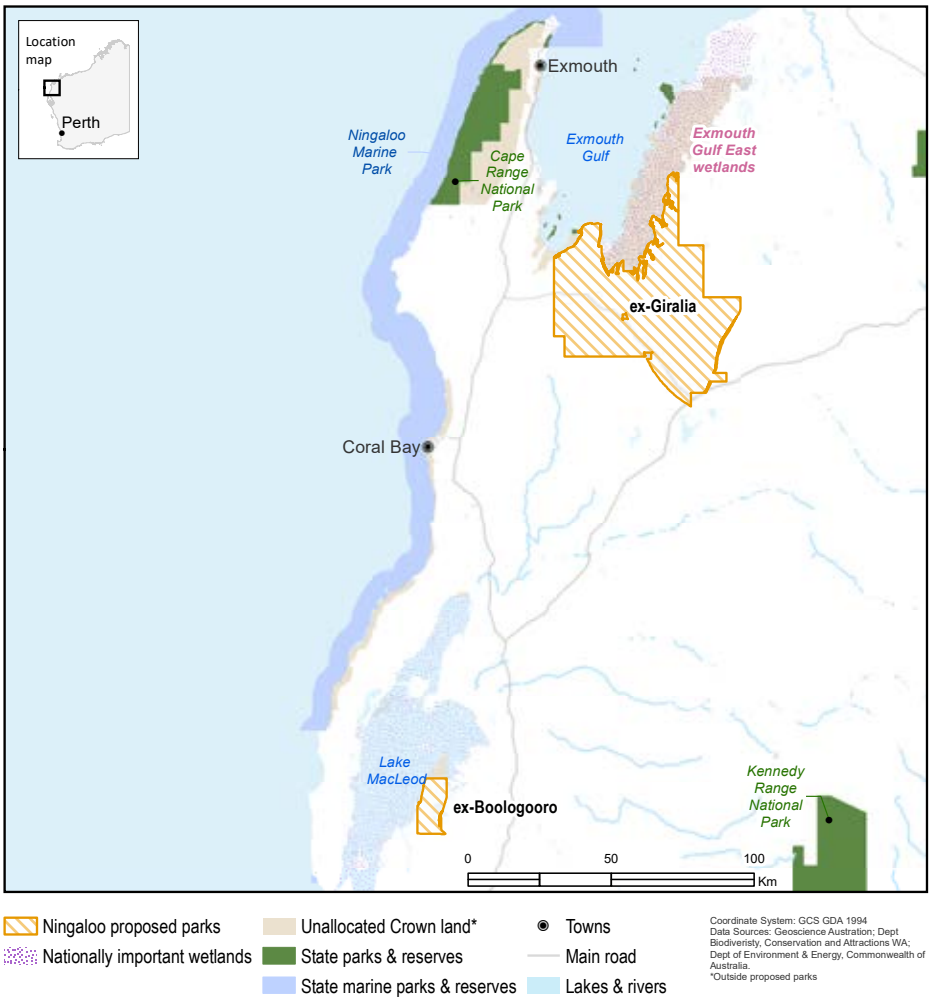
Wolarry Swamp on ex Muggon is part of an extensive paleodrainage system with significant wetlands important for birds, including migratory shorebirds listed under international agreements. Photo: David Blood (DEC)

Young loggerhead turtles (*Caretta caretta*) face many perils but if they reach adulthood, when they are too big for most predators, they can live 50 years or more. Adults also face perils due largely to entanglement in fishing gear. The species is endangered in Australia. Photo: James Cordwell

Carnaby's black-cockatoos (*Calyptorhynchus latirostris*), unique to Western Australia, are endangered mainly due to habitat destruction. They need old eucalypt trees for nesting and eat the seeds of trees such as banksias and hakeas. Photo: Georgina Steytler

Ningaloo to Exmouth Gulf

Two proposed new parks lie near the Ningaloo Coast World Heritage Area. Their primary values lie with their proximity to 2 exceptional wetlands – Exmouth Gulf East and Lake MacLeod – each designated as nationally important and each highly productive for shorebirds and many other species and important for maintaining the health of coastal and marine habitats.



Natural highlights

- Greater protection for 2 nationally important wetlands including the world's largest inland mangrove community
- A priority-1 ecological community, the Yarcowie Land System
- 23 threatened and priority species including bilbies and grey falcons
- World class fossil sites including 100-million-year-old shark teeth and dinosaur bones
- Greater protection for dozens of shorebird species, including 25 threatened and priority species such as the lesser sand plover
- 13 ecosystems and 7 plant communities with no protection in existing reserves

Figure 4: The proposed parks of 'Ningaloo to Exmouth Gulf'

Proposed Park	Properties	Size (hectares)	Traditional Owners (native title parties)
'Giralia' National Park (Class A)	ex Giralia	232,000	Gnulli, Thalanyji
'Boologooro' Nature Reserve (Class A)	ex Boologooro	15,000	Gnulli

Ruddy turnstones (*Arenaria interpres*) fly north each year, as far as the High Arctic, to breed. Their name comes from their habit of flicking stones to uncover prey. Photo: Georgina Steytler

Proposed 'Giralia' National Park

This proposed park on the eastern edge of Exmouth Gulf shares 70 kilometres of its northern border with the Exmouth Gulf East wetland. The property features sandplains, sand dunes, limestone plains and hills, undulating stony plains and saline mudflats, with spinifex, saltbush and bluebush, wattles, scattered eucalypts, and mangroves on the shoreline. It is important for the health of Exmouth Gulf, one of Australia's most significant coastal environments. The proposed park would protect the following:

- Exmouth Gulf East, a nationally important wetland and key biodiversity area important for migratory seabirds, including several threatened species
- 24 threatened and priority species, including the lesser sand plover (endangered), bilby (vulnerable), grey falcon (vulnerable) and possibly the night parrot (critically endangered, recorded there in 1967)
- the Yarcowie Land System, a priority-1 ecological community with a very restricted distribution threatened by overgrazing
- 10 plant communities (5 with no protection in existing reserves) and 10 sub-bioregional ecosystems (6 with no existing protection)
- world-class fossil sites from the Cretaceous period (68-66 million years ago), rich deposits of ammonites.

Proposed 'Boologooro' Nature Reserve

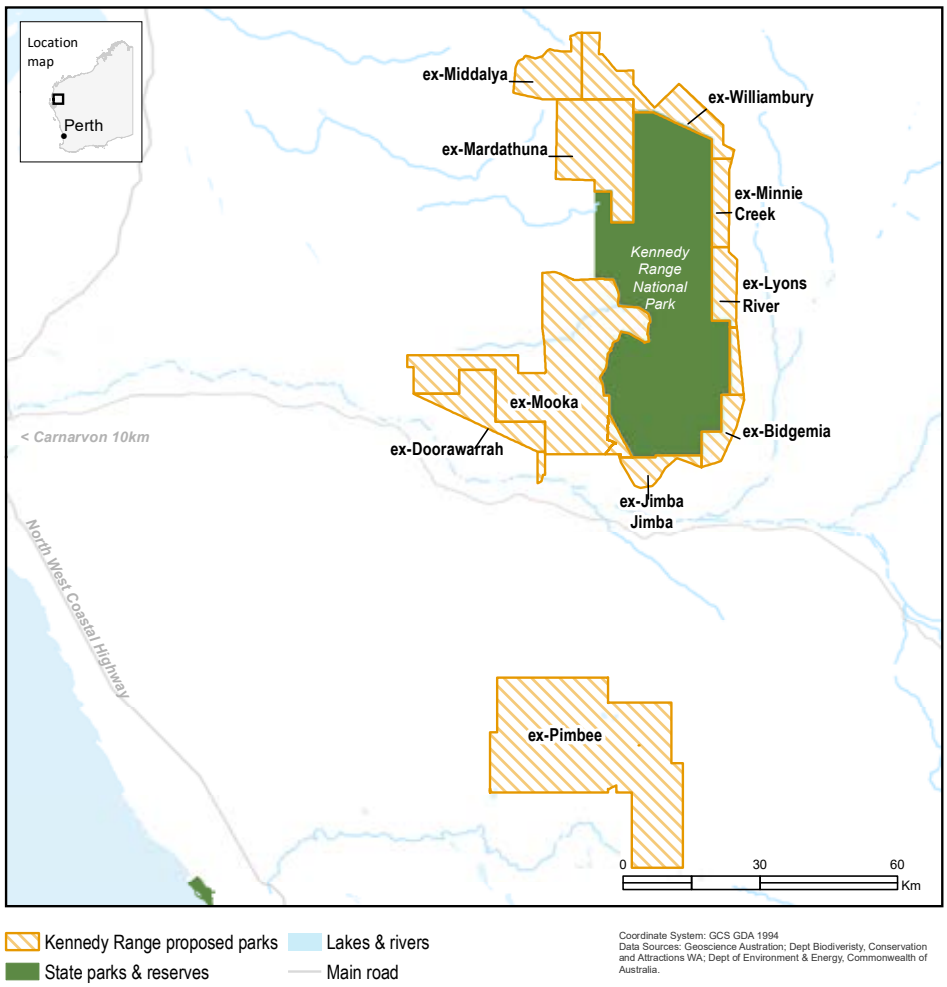
This proposed park lies on the eastern shore of Lake MacLeod, a large salt lake inland from the Ningaloo Coast World Heritage Area highly significant for shorebirds. More than 100,000 birds have been counted at a time, and 70 species have been recorded, including several that breed there. The property features saline and sandy plains with low shrublands of samphire, bluebush and saltbush. The proposed park would protect the following:

- the nationally important wetland, Lake MacLeod – of national and international significance to migratory shorebirds and nomadic Australian shorebirds as a stopover, wintering and drought refuge area
- 4 plant communities (1 with no protection in existing reserves) and 4 sub-bioregional ecosystems (3 with no protection).

Dingoes (*Canis lupus dingo*) arrived in Australia probably about 3500 years ago. Although predators themselves, they are thought to benefit some threatened species by suppressing the abundance or activities of feral cats and foxes. Photo: Gary Meredith

Kennedy Range Country

Kennedy Range Country is characterised by red sandy plains and stony plains with wattle shrublands and woodlands, and the range itself – a weathered sandstone plateau rising 100 metres above the plains. It was probably created by uplift about 20 million years ago and has since mostly eroded away. Marine fossils reveal it was once a marine shelf and fringing shoreline.



Natural highlights

- 18 priority species and ecological communities including plants unique to Kennedy Range
- 5 plant communities and 13 ecosystems with no protection in existing reserves
- A more than 2-fold expansion of Kennedy Range National Park
- Scenic beauty, remoteness and naturalness
- Springs and soaks fringed with river red gums and paperbarks
- Marine fossils revealing geological evolution

Figure 5: The proposed parks of 'Kennedy Range Country'

Proposed Park	Properties	Size (hectares)	Traditional Owners (native title parties)
Kennedy Range National Park expansion	ex Bidgemia, ex Doorawarrah, ex Jimba Jimba, ex Lyons River, ex Mardathuna, ex Middalya, ex Minnie Creek, ex Mooka, ex Williambury	193,000	Gnulli, Thudgari
'Pimbee' Conservation Park	ex Pimbee	99,000	Gnulli, Malgana

A flowering native bush tomato on the road to Sunrise View lookout, Kennedy Range National Park. Photo: Michael Pelusey

Proposed expansion of Kennedy Range National Park

The proposed expansion would more than double the area of Kennedy Range National Park and substantially improve landscape connectivity by capturing the northern extent of the range and creating a buffer. Its high scenic qualities and sense of naturalness and remoteness are not readily available elsewhere in the Carnarvon bioregion. The eastern escarpment has dramatic sandstone cliffs dissected by steep canyons, which turn into waterfalls after rain. The proposed park expansion would protect the following:

- 2 priority-4 ecological communities – the springs of the western Kennedy Range (fringed by tall river gums and cadjeputs) and the spinifex-dominated plant assemblages of the sand dunes on top of the plateau
- 14 threatened and priority species, including the western pebble-mound mouse and an undescribed pea known only from the upper slopes of Kennedy Range
- 14 plant communities (4 with no protection in existing reserves) and 14 sub-bioregional ecosystems (7 with no existing protection).

Proposed 'Pimbee' Conservation Park

This proposed park features red sand dunes and swales with wattle shrublands and low woodlands, scattered shrubs, and a prominent grass layer. The Wooramel River passes through the south-east corner, and there are small claypan lakes in the centre that fill after rain. The proposed park would protect the following:

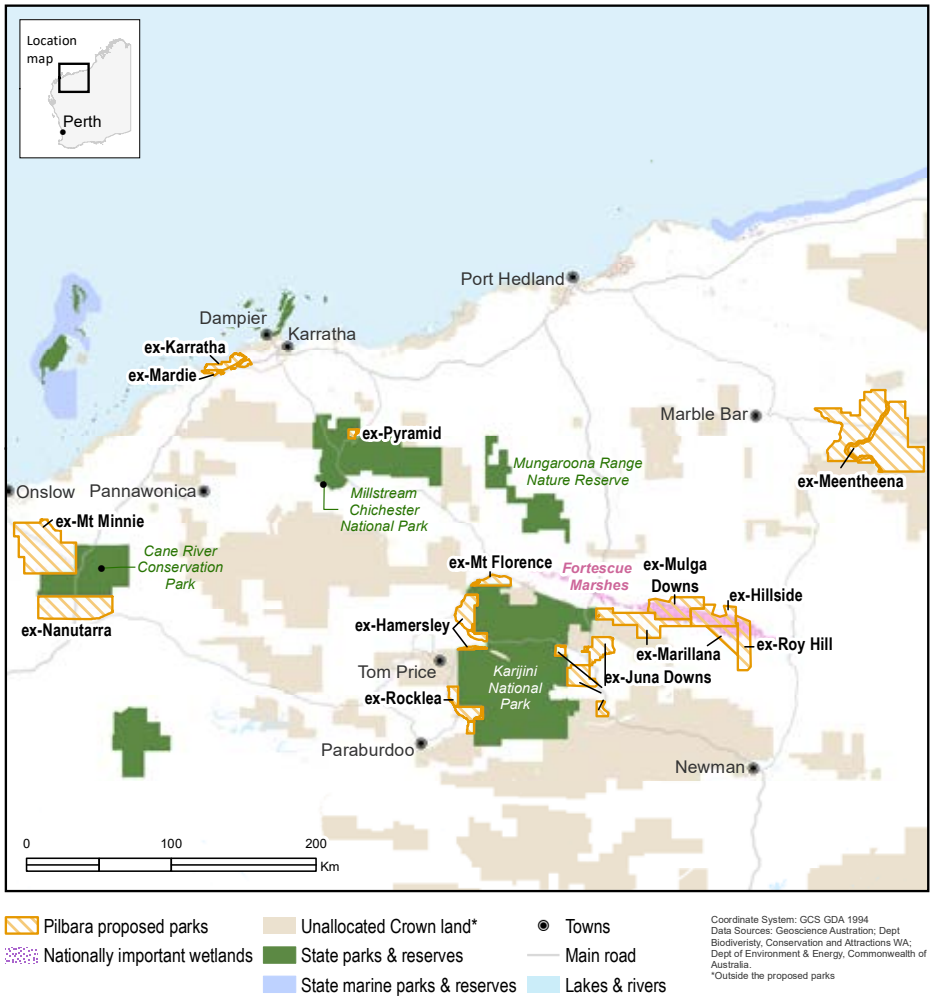
- 9 plant communities (4 with no protection in existing reserves) and 9 sub-bioregional ecosystems (6 with no existing protection)
- the Yagina and Yalbalgo land systems, with no protection in existing reserves
- 3 priority plant species and 1 priority animal species.

One hope for the future is that locally extinct species such as the black-flanked rock-wallaby (*Petrogale lateralis lateralis*) can be reintroduced to Kennedy Range National Park. This will require rigorous control of foxes and goats. Photo: Sarah Matheson

Pilbara Biodiversity Hotspot

The Pilbara is a highly distinctive bioregion, featuring rugged rocky ranges of great antiquity with incised gorges, rolling hills, granitic and alluvial plains, and intermittently flowing rivers. The Pilbara has some of the oldest exposed rocks on Earth, up to 3.7 billion years old. The vegetation is largely low wattle woodlands and snappy gums over spinifex and other grasses.

The proposed parks provide an opportunity to increase protection for nature in a region with very high ecological significance, high threats and low levels of protection in the reserve system. The Pilbara is one of Australia's centres of biological endemism, with many unique plants and animals, reflected in its designation by the federal government as 1 of 15 national biodiversity hotspots. The region has very high reptile diversity, including the greatest number of gecko species in Australia. It is is globally significant for the diversity of stygofauna (animals inhabiting groundwater) and is also botanically rich.



Natural highlights

A national biodiversity hotspot including for night parrots and northern quolls

91 threatened and priority species including bilbies

The nationally important Fortescue Marsh wetland

A centre of diversity for reptiles and stygofauna

High plant diversity and endemism

Ancient rock landscapes with 2.7-billion-year-old stromatolite fossils

Figure 6: Proposed parks of the 'Pilbara Biodiversity Hotspot'

Proposed Park	Properties	Size (hectares)	Traditional Owners (native title parties)
Karijini National Park expansion (Class A)	ex Hamersley, ex Rocklea, ex Mt Florence, ex Juna Downs, ex Marillana, ex Mulga Downs, ex Hillside, ex Roy Hill	301,000	Eastern Guruma, Yinhawangka, Banjima, Yindjibarndi, Nyiyaparli, Palyku
Millstream Chichester National Park expansion (Class A)	ex Pyramid	3,000	Ngarluma/Yindjibarndi
Cane River Conservation Park expansion (Class A)	ex Minnie, ex Nanutarra	180,000	Thalanyji, Puutu Kunti Kurrama & Pinikura
'Meentheena' National Park (Class A)	ex Meentheena	217,000	Njamal
'Karratha – Mardie' National Park (Class A)	ex Karratha, ex Mardie	18,000	Yaburara & Mardudhunera, Yindjibarndi/Ngarluma

Proposed expansion of Karijini National Park

This expansion would increase the size of Karijini by almost 50%. The Hamersley Range and the Fortescue Marsh are critical areas for conserving the Pilbara's rich and unique biodiversity. The values include high reptile, plant and stygofauna diversity. Western Australia's Environmental Protection Authority has recommended these properties be afforded the greatest possible protection for their high values and to counter the impacts of extensive mining. The proposed expansion would protect the following:

- Fortescue Marsh, a wetland of national importance and potential Ramsar site that can occupy over a thousand square kilometres and attract over a quarter of a million waterbirds
- 4 priority-1 ecological communities: the coolibah-lignum flats (subtypes 1 and 2), Brockman iron cracking clay communities on Hamersley Range and Fortescue Marsh
- 54 threatened and priority plant species, many unique to area and more than a quarter yet to be scientifically described
- 18 threatened and priority animal species, including night parrot (critically endangered), northern quoll (endangered), and the grey falcon, ghost bat, Pilbara leaf-nosed bat and Pilbara olive python (all vulnerable)
- 10 plant communities (6 with little or no protection in existing reserves) and 12 sub-bioregional ecosystems (7 with little or no existing protection).

Proposed expansion of Millstream Chichester National Park

Millstream Chichester National Park is a rugged, rocky area with spinifex grasslands. Incorporating ex Pyramid, enclosed on 3 sides by the park, would improve the park's integrity. The proposed expansion would protect the following:

- 4 threatened and priority species, including the northern quoll (endangered) and western pebble-mound mouse
- 3 plant communities (2 with little or no protection in existing reserves) and 5 sub-bioregional ecosystems (3 with little or no existing protection).

The Pilbara – not yet invaded by cane toads – is one of the last strongholds for the endangered northern quoll (*Dasyurus hallucatus*).

Proposed expansion of Cane River Conservation Park

This expansion would more than double the size of Cane River Conservation Park, which was gazetted in recognition of its plant and geological associations not found elsewhere in the region. The vegetation on the proposed additions, dominated by wattles and spinifex, is mostly intact, with few weed species. They are rich in stygofauna and vertebrate animals, particularly reptiles, and have high plant diversity for an arid region. The proposed expansion would protect the following:

- 11 plant communities, including 8 with little or no protection in existing reserves, and 12 sub-bioregional ecosystems, including 7 with little or no existing protection
- 4 priority plant species and 2 animal species, including the western pebble-mound mouse.

Proposed 'Meentheena' National Park

This proposed park is geologically complex, indicating a high level of biogeographic diversity. It features spinifex grasslands with snappy gums and kanjis and other wattles, and is dissected by the Nullagine River. It would protect the following:

- 13 threatened and priority species, including (possibly) the night parrot (critically endangered), northern quoll (endangered) and the bilby, ghost bat, Pilbara leaf-nosed bat and grey falcon (all vulnerable)
- 5 plant communities (4 with little or no protection in existing reserves) and 5 sub-bioregional ecosystems (4 with little or no existing protection)
- 2.7 billion-years-old fossil stromatolites that are internationally significant for what they reveal about the evolution of early life.

Proposed 'Karratha – Mardie' National Park

This proposed new park would enhance protection of the coastal margin from Cape Preston to Cape Keraudren on a coast with little existing protection. It would protect the following:

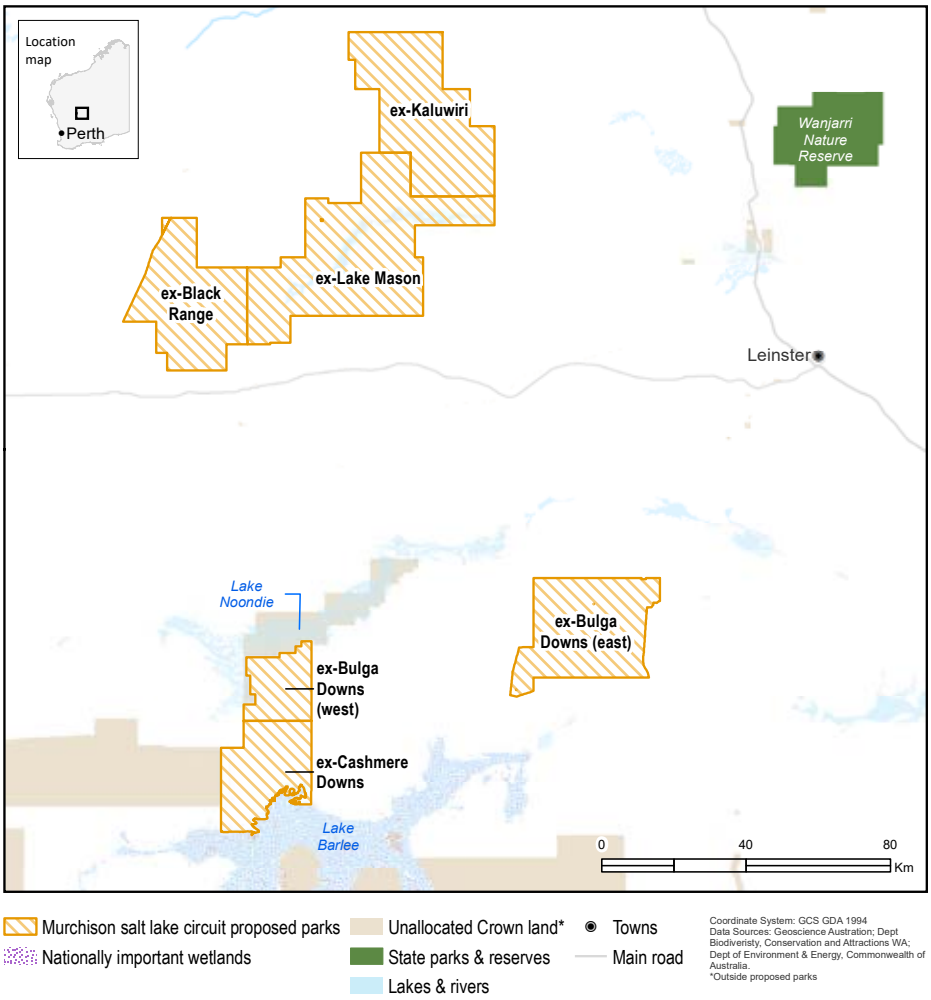
- 2 priority-3 ecological communities: the horseflat land system of the Roebourne and the coastal dune native tussock grassland community dominated by *Whiteochloa airoides*
- 18 threatened and priority species, including 3 threatened migratory shorebirds (bar-tailed godwit, curlew sandpiper and great knot) and the ghost bat (all vulnerable) and a plant known from just one population, *Goodenia pallida*
- 7 plant communities (3 with little to no protection in existing reserves) and 7 sub-bioregional ecosystems (4 with little to no protection).

The areas proposed for inclusion in Karijini National Park harbour the Pilbara olive python (*Liasis olivaceus barroni*) (vulnerable), whose preferred habitat is in the ranges in deep gorges and around water holes. Photo: Mike Brown

The proposed parks in the Pilbara provide an opportunity to increase protection for nature in a region with very high ecological significance, high threats and low levels of protection in existing reserves. Photo: Jessica Wyld

Murchison Salt Lake Circuit

In this arid area of vast flat and undulating sandplains occasionally broken by hills, ridges and domes, water has an especially powerful ecological significance. The salt lakes that fill every decade or so become breeding sites for waterbirds that may travel thousands of kilometres to feed on hyper-abundant crustaceans. And below ground, in permanent waters, are other invertebrates, including potentially dozens of unique species. The wetlands and aquifers reflect the deep history of the region in their association with ancient dry river valleys that functioned as rivers during much wetter times millions of years ago. Another link to the deep past are the low eroded hills featuring banded ironstone formations, which support distinctive ecological communities. The vegetation on the plains is dominated by mulga woodlands often rich in ephemeral species, as well as spinifex grasslands, saltbush shrublands and samphire shrublands.



Natural highlights

- Greater protection for salt lakes important for breeding of banded stilts and other waterbirds
- 3 unique priority-1 vegetation communities associated with banded ironstone ranges
- 3 unique priority-1 groundwater communities, part of a globally significant archipelago of calcrete communities
- 26 threatened and priority species including malleefowl
- 7 plant communities and 16 ecosystems with no protection in existing reserves
- Corridors linking vast wetlands including Lake Barlee, Western Australia's second largest lake

Figure 7: Proposed parks of the 'Murchison Salt Lake Circuit'

Proposed Park	Properties	Size (hectares)	Traditional Owners (native title parties)
'Cashmere – Bulga Downs' National Park (Class A)	ex Cashmere Downs, ex Bulga Downs	155,000	Wutha
Proposed 'Black Range – Kaluwiri' National Park (Class A)	ex Lake Mason, ex Black Range, ex Kaluwiri	102,000	Tjiwarl

One of the great Australian nomads is the banded stilt (*Cladorhynchus leucocephalus*). In ways mysterious to us, they know when rain has fallen hundreds or thousands of kilometres away, perhaps offering them a rare chance to breed. Photo: Amanda Keesing

Proposed 'Cashmere – Bulga Downs' National Park

This proposed park spans the area between 2 large ecologically important salt lakes – Noondie and Barlee (Western Australia's second largest lake) – which mark once-major river systems, representing probably the oldest surviving geomorphological features on the Yilgarn Craton. The gently undulating sandplains feature wattle and mallee woodlands and shrublands, spinifex grasslands and samphire shrublands. The proposed park would protect the following:

- northern shores of Lake Barlee, a nationally important wetland, key biodiversity area and breeding site for banded stilts
- 7 threatened and priority species, and a priority-1 ecological community (a vegetation complex associated with banded ironstone formation)
- 13 plant communities (all with little or no protection in existing reserves) and 15 sub-bioregional ecosystems (all with little or no existing protection).

Proposed 'Black Range – Kaluwiri' National Park

This proposed park features gently undulating sandplains and wash plains of spinifex grasslands and mulga and mallee woodlands, with breakaways, low hills and salt lakes important for waterbirds when they fill after rain. The area is rich in reptiles (about 65 species), mammals (18 species, almost the entire number known for the bioregion) and plants (467 species). The proposed park would protect the following:

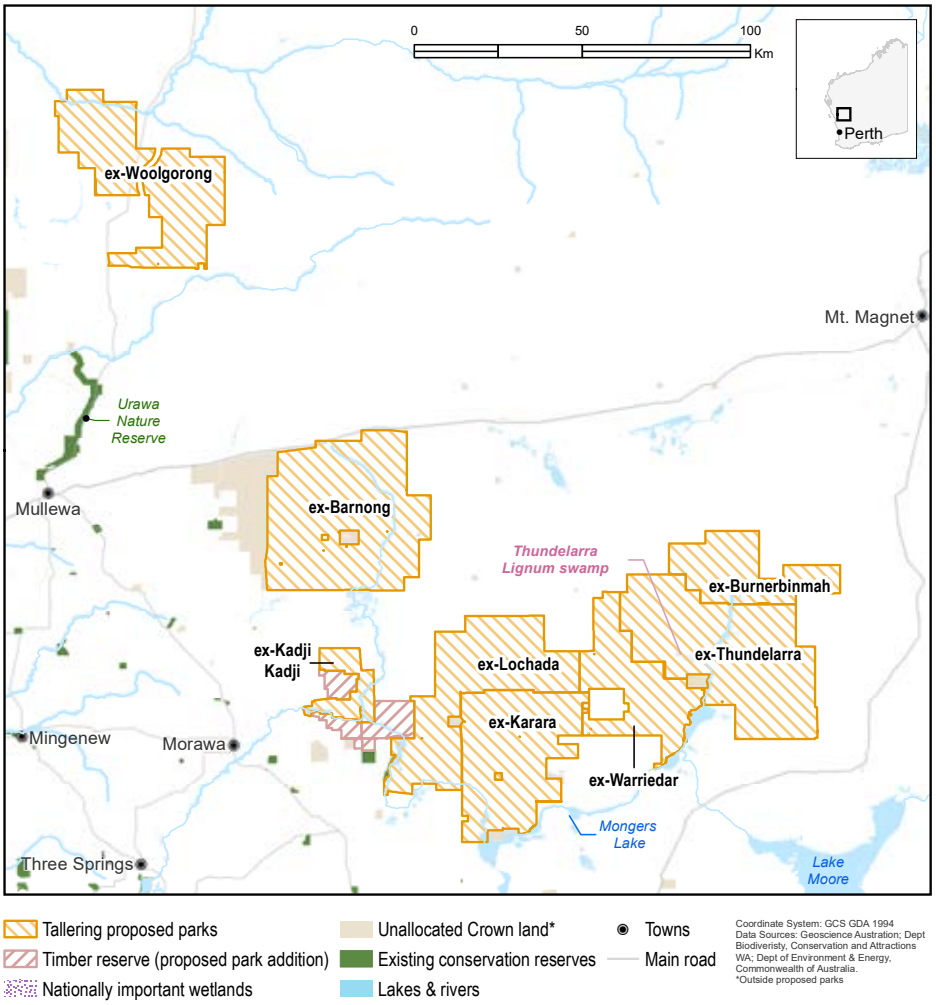
- 4 priority-1 ecological communities (2 invertebrate communities in calcretes and 2 vegetation complexes associated with banded ironstone formation)
- 19 threatened and priority species, including the malleefowl
- 7 plant communities (all with little or no protection in existing reserves) and 7 sub-bioregional ecosystems (all with little or no existing protection), including 1 with 99% of its extent on the proposed park.

The banded iron formation of Windarling Range, south of ex Cashmere Downs, harbours specialised and restricted plants such as *Tetratheca paynterae*, which grows only in the crevices of such outcrops. Conservation of these unique plants is challenging due to the mineral values of ironstone ranges. Photo: Robin Chapple

The desert mouse (*Pseudomys desertor*), recorded on ex Lake Mason, inhabits a wide variety of habitats including on sand plains and sand dunes and around salt lakes. It is active at night and eats mainly leaves. Photo: Ryan Francis

Tallering Botanical Trail

The proposed parks lie in a transition zone between the highly diverse South West and the arid Eremaean botanical provinces. The transition is reflected in a shift from low mulga woodlands in the north to denser woodlands and shrublands dominated by wattles and eucalypts in the south-west. Plant diversity is high due to the overlap and the topographical and geochemical diversity provided by granite outcrops and greenstone and banded ironstone ranges, which are prominent landmarks in the vast red- and buff-coloured sandy plains typical of the area. The new parks would protect many unique plant species and communities and a diverse array of animals.



Natural highlights

- Outstanding floral diversity and endemism
- 94 threatened and priority species such as malleefowl and painted snipe
- 5 priority-1 banded ironstone plant communities, 2 priority-1 calcrete groundwater communities, 1 critically endangered eucalypt woodland community
- Nationally important wetland – the Thundelarra lignum swamp
- A major part of an Australian centre of wattle endemism
- Very high level of habitat diversity with 54 sub-bioregional ecosystems, 36 lacking protection in existing reserves

Figure 8: The proposed parks of the 'Tallering Botanical Trail'

Proposed Park	Properties	Size (hectares)	Traditional Owners (native title parties)
'Kadji Kadji – Burnerbinmah' National Park (Class A) ex Warriedar, adjacent timber reserves	ex Burnerbinmah, ex Thundelarra, ex Kadji Kadji, ex Karara, ex Lochada,	533,000	Badimia People, Southern Yamatji, Widi Mob, Badimia People
'Barnong' National Park	ex Barnong	168,000	Southern Yamatji, Mullewa Wadjarri, Widi Mob
'Woolgorong' Conservation Park	ex Woolgorong	116,000	Mullewa Wadjari, Wajarri Yamatji, Widi Mob

The vibrancy of these landscapes when wildflowers bloom (here on ex Lochada) makes them a valuable tourism asset. Photo: Linda Goncalves

Proposed 'Kadji Kadji – Burnerbinmah' National Park

The landscapes of this proposed park are diverse, with red and buff-coloured sandplains broken by granite outcrops, low greenstone ranges (some with a spine of banded iron formation), freshwater wetlands and salt lakes. It features shrublands and low woodlands dominated by different types of wattles, some with scattered eucalypts, as well as shrublands of saltbush and bluebush. The proposed park has spectacular plant diversity, with close to 900 species recorded, including several unique to banded ironstone ranges. It is a major part of an Australian centre of wattle endemism. The proposed park would protect the following:

- Thundelarra Lignum Swamp, a freshwater wetland listed as nationally important that is significant for waterbirds, including at least 14 species that breed there
- 5 priority ecological communities, including 3 priority-1 vegetation complexes associated with banded ironstone formation, a priority-3 lignum-canegrass shrubland and the priority-3 Western Australian Wheatbelt eucalypt woodland community (listed as critically endangered by the Australian government)
- 63 threatened and priority plant species (a fifth yet to be scientifically described), including Woodman's wattle (*Acacia woodmaniorum*), which only grows high up in ironstone ranges and whose 3 surviving populations are all threatened by mining
- 8 threatened and priority animal species, including painted snipe (endangered) and malleefowl, gilled slender blue-tongue, western spiny-tailed skink and shield-backed trapdoor spider (all vulnerable)
- 32 plant communities (18 with little or no protection in existing reserves) and 43 sub-bioregional ecosystems (36 with little or no existing protection), including 1 community and 3 ecosystems with more than 85% of their extent on the proposed park.

Proposed 'Barnong' National Park

This proposed park features many saline wetlands and lignum-dominated swamps. It is bisected by the Salt River, an ancient river system now dry most of the time. Beneath it lie limestone aquifers that host unique communities of groundwater invertebrates. They are part of an archipelago of groundwater communities in the Yilgarn region, which together contain the most diverse water beetle assemblage in the world and a highly diverse crustacean fauna. The proposed park would protect the following:

- 4 priority-1 ecological communities: 2 calcrete groundwater invertebrate communities and 2 vegetation complexes associated with banded ironstone formation
- 15 threatened and priority species, including the malleefowl and shield backed spider (both vulnerable), and the endangered varnish bush (*Eremophila viscida*)
- 15 plant communities (8 with little or no protection in existing reserves) and 17 sub-bioregional ecosystems (15 with little or no existing protection), including 1 with 85% of its extent on the proposed park.

The future of woodman's wattle (*Acacia woodmaniorum*) (vulnerable), which only grows high up in ironstone ranges, is at risk unless it can be securely protected in a conservation reserve. Photo: Neomyrtus

Proposed 'Woolgorong' Conservation Park

This proposed park straddles the ranges between the Murchison and Greenough rivers, and the Murchison flows through it in the north. It features low wattle woodlands and shrublands, dominated variously by mulga, snakewood, bowgada, jam, limestone wattle, minnieritchie, sandplain wattle and bramble wattle. The proposed park would protect the following:

- 6 plant communities (all with little to no protection in existing reserves) and 8 sub-bioregional ecosystems (all with little to no existing protection)
- 17 threatened and priority species, including a plant found only there (*Malleostemon* sp. Woolgorong Station), the malleefowl (vulnerable) and the western spiny-tailed skink (vulnerable).

The endangered varnish bush (*Eremophila viscida*), known from only a few small populations, has been recorded on ex Barnong. Photo: Russell Cumming

Mid West Mulga Country

These arid landscapes feature vast low woodlands dominated by mulga and other wattles, with rugged ranges, tors and hills of rock that can be billions of years old. The rivers flow intermittently, but often have refugial spring-fed waterholes. Some ancient river valleys are barely discernable now, blocked by sediments due to much drier times, but their past is evident still in salt lakes that fill occasionally and subterranean calcretes that harbour unique communities of invertebrates adapted to life in the dark. The resources for wildlife above ground fluctuate wildly, depending on rain that falls erratically.

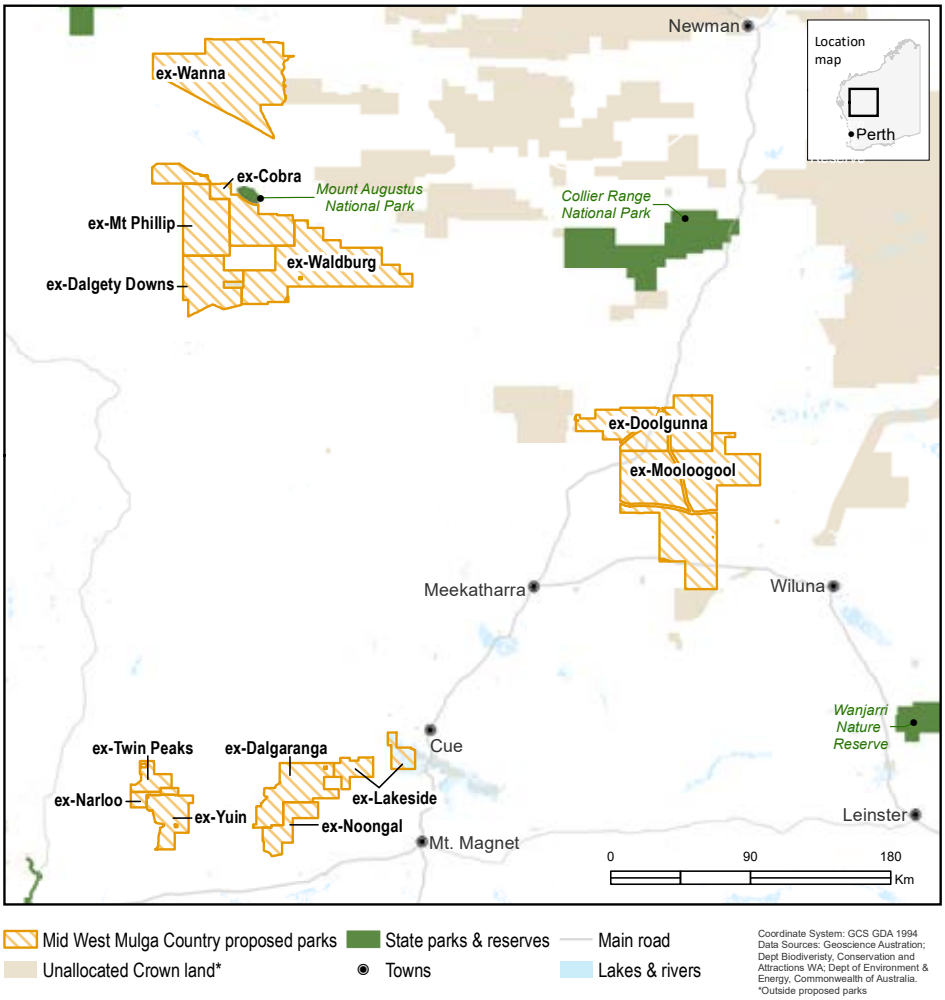


Figure 9: The proposed parks of 'Mid West Mulga Country'

Natural highlights

- Richly diverse in mulgas and other wattles
- 56 threatened and priority species including malleefowl and long-tailed dunnart
- Spectacular scenery – rugged ranges, granite inselbergs, inland rivers
- High reptile diversity including a unique form of the nationally endangered western spiny-tailed skink
- 39 ecosystems and 10 plant communities with no protection in existing reserves
- Greatly improved protection of the Gascoyne and Murchison bioregions

Proposed Park	Properties	Size (hectares)	Traditional Owners (native title parties)
'Twin Peaks – Yuin' Conservation Park (Class A)	ex Twin Peaks, ex Narloo, ex Yuin	102,000	Mullewa Wadjari Community, Wajarri Yamatji, Widi Mob
'Noongal – Lakeside' National Park (Class A)	ex Dalgaranga, ex Noongal, ex Lakeside	202,000	Wajarri Yamatji, Yugunga-Nya People
'Doolgunna – Mooloogool' National Park (Class A)	ex Mooloogool, ex Doolgunna	591,000	Nharnuwangga, Yugunga-Nya People
Expansion of Mount Augustus National Park (Class A)	ex Cobra, ex Waldburg, ex Mt Phillip, ex Dalgety Downs	604,000	Wajarri Yamatji, Nharnuwangga, Gnulli, Thiin-Mah Warriyangka, Tharrkari, Jiwarli
'Wanna' Conservation Park (Class A)	ex Wanna	289,000	Jurruru People, Thiin-Mah Warriyangka, Tharrkari, Jiwarli, Wajarri Yamatji

Proposed 'Twin Peaks – Yuin' Conservation Park

This proposed park lies in the headwater catchments for the Greenough and Murchison river systems, both of which flow intermittently. With rivers, granite hills and ranges, as well as wash plains, stony plains, sand plains and river plains, the landscape is varied and has high scenic qualities. It features mulga woodlands, shrublands dominated by other wattles such as miniritchie and bowgada, and saltbushes and bluebushes. The proposed park would protect the following:

- 4 threatened and priority species including the western spiny-tailed skink (vulnerable)
- 5 plant communities (4 with little to no protection in existing reserves) and 9 sub-bioregional ecosystems (all with little to no protection).

The spinifex hopping mouse (*Notomys alexis*), here on ex Doolgunna, is well adapted to aridity, producing the most concentrated urine of any mammal ever recorded. Photo: Harry Everett (DEC)

A unique black form of the nationally endangered western spiny-tailed skink (*Egernia stokesii badia*) occurs on the proposed Twin Peaks – Yuin' Conservation Park. Photo: Jordan Vos

Proposed 'Noongal – Lakeside' National Park

This proposed park has diverse and interesting landscapes. It features a large salt lake (Lake Austin, important for waterbirds) and surrounding saline plains, extensive sandplains, granite tor fields and mountains of greenstone and meta-sediments. It has woodlands and shrublands dominated by mulga and other wattles, saltbush, bluebush and samphire shrublands and spinifex grasslands. The proposed park would protect the following:

- 2 priority-1 calcrete groundwater ecological communities
- 18 threatened and priority species, including the western spiny-tailed skink and shield-backed trapdoor spider (both vulnerable) and a fairy shrimp, *Branchinella wellardi*
- 13 plant communities (9 with little to no protection in existing reserves) and 20 sub-bioregional ecosystems (all with no protection), including 1 with its entire extent on the proposed park.

Waterholes fed by springs, such as Lee Steere Pool here on ex Wanna, provide resources and refuges for many species. Photo: Samille Mitchell (DEC)

Proposed 'Doolgunna – Mooloogool' National Park

This proposed park is on the Meekatharra Plateau, an ancient eroded landscape topped by undulating plains of sand and alluvium, with old rock protruding in outcrops, mesas and low hills and ranges. Most of it is covered in low mulga woodlands or shrublands, spinifex grasslands with scattered mulga and eucalypts, and saltbush and bluebush shrublands. Yandthangunna Creek has permanent rock pools and is lined with ghost gums. The proposed park would protect the following:

- 2 priority-1 ecological communities: a calcrete groundwater invertebrate community and vegetation complexes on banded ironstone formation
- 26 threatened and priority species, including the malleefowl, brush-tailed mulgara and long-tailed dunnart and the mallee *Eucalyptus semota*, restricted to a few populations in the Gascoyne
- 7 plant communities (6 with little to no protection in existing reserves) and 16 sub-bioregional ecosystems (all with little to no protection).

Proposed expansion of Mount Augustus National Park

Mount Augustus National Park is a small park centred around Burringurrah (Mount Augustus), a large isolated sandstone inselberg that rises some 700 metres above the surrounding stony red sandplain. This proposed expansion would increase its size more than 50-fold. Most of the area is covered in low mulga woodlands or shrublands, as well as shrublands dominated by other wattles, poverty bushes and cassias. The proposed expansion would protect the following:

- 4 priority ecological communities: a priority-1 calcrete groundwater invertebrate community and 3 priority-3 land systems (the Peedawarra, Bibbingunna and Diorite)
- 22 threatened and priority species, including the Mount Augustus foxglove (vulnerable)
- 10 plant communities (9 with little to no protection in existing reserves) and 10 sub-bioregional ecosystems (8 with little to no protection).

Proposed 'Wanna' Conservation Park

This proposed park features rugged granite and quartz ranges, hills, ridges and tors, and stony plains. Most of the area is covered in low mulga woodlands or shrublands, and there are also shrublands dominated by other wattles and spinifex grasslands. The proposed park would protect the following:

- 1 priority-3 ecological community: 100% of the Scoop Land System
- 5 priority species, including *Eremophila scrobiculata*, known from a single population
- 7 plant communities (5 with little to no protection in existing reserves) and 7 sub-bioregional ecosystems (6 with little to no protection).

The desert banded snake (*Simoselaps bertholdi*), here on ex Waldburg, is a burrowing sand-swimmer that preys on small lizards. Photo: Samille Mitchell (DEC)

Permanent rock pools, like this one known as Fish Holes on ex Doolgunna, are important refuges in the arid eastern Gascoyne region. Photo: David Blood (DEC)

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