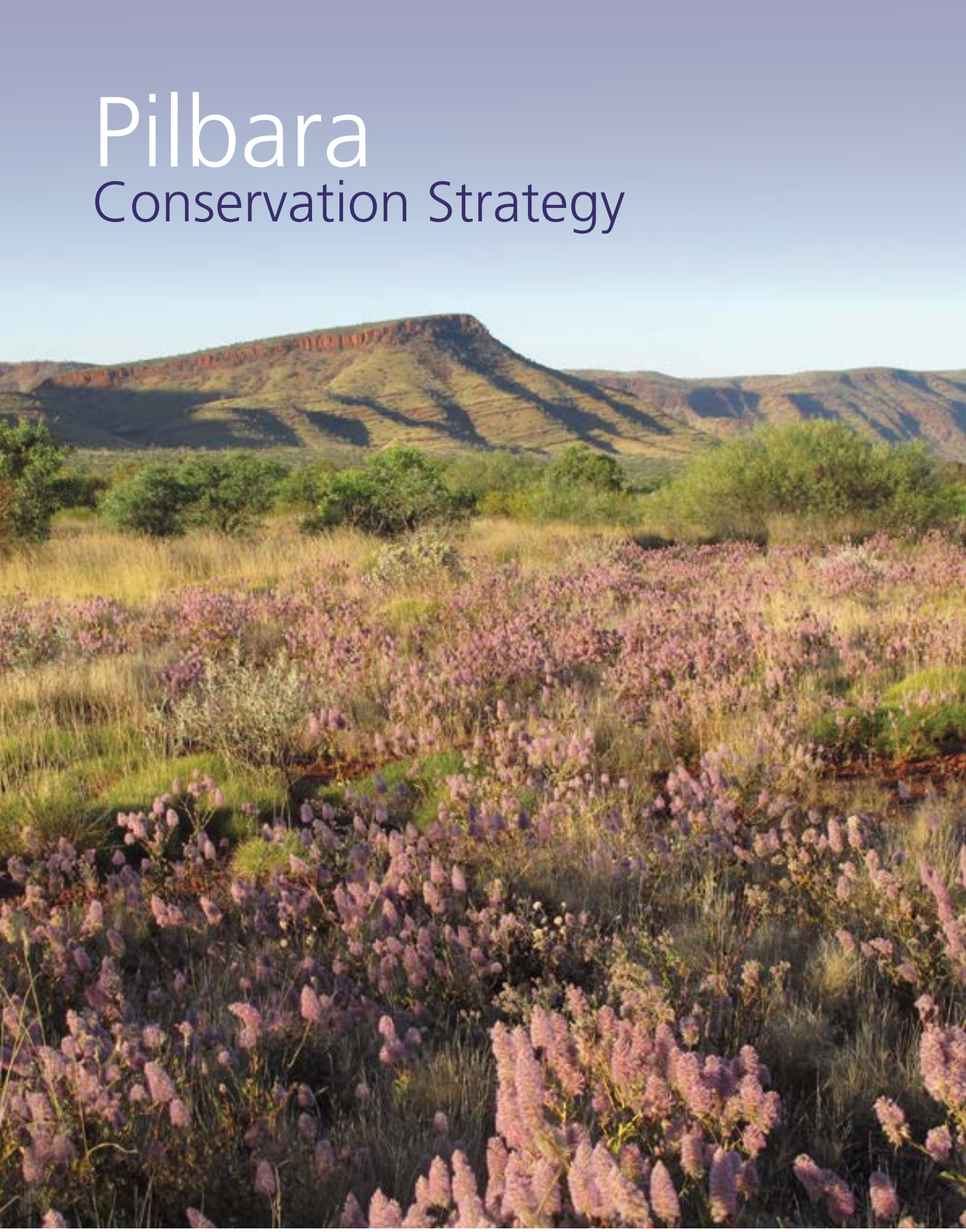
Pilbara
Conservation Strategy



GOVERNMENT OF
WESTERN AUSTRALIA

Pilbara
Conservation Strategy

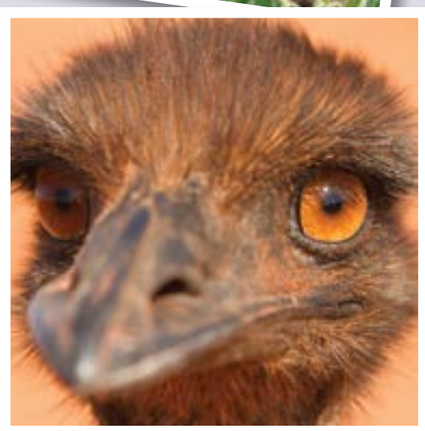
The Pilbara is as vast as it is ancient. The region, covering more than 17,800,000 hectares, is known for its spinifex-covered plains, rugged ranges, plunging gorges, tumbled iron-rich boulders and abundant wildlife.

It is a living landscape cared for by the traditional custodians for millennia. Aboriginal people retain strong links to and responsibility for Country, and they have a key role in protecting the Pilbara's cultural and natural heritage. The region supports a rich and diverse variety of plants and animals, is a centre of endemism, and despite its dry climate, has important rivers and wetlands.

The Pilbara Conservation Strategy outlines a landscape-scale approach to biodiversity conservation across the Pilbara region. It provides strategic direction for conservation actions that may be funded from a variety of sources, including State and Commonwealth governments, natural resource management groups, non-government organisations, community groups and industry, including through offsets to counterbalance the residual impacts of resource and infrastructure projects. This strategy aims to deliver improved conservation outcomes through on-ground actions across a variety of tenures in collaboration with partners throughout the Pilbara region.

Vision

The diverse natural environments and exceptional biodiversity of the Pilbara are enhanced and conserved, through enduring partnerships, for their intrinsic value and for the social, cultural, spiritual and economic wellbeing of the community.



Main Spinifex, Millstream Chichester National Park. **Inset top left** Ring-tailed dragon. Photos – Judy Dunlop. **Inset top** Sturt's desert pea. Photo – Val English **Inset above** Emu. Photo – Judy Dunlop

Key outcomes

This strategy provides a framework and direction for landscape-scale conservation initiatives to protect and enhance the biodiversity of the Pilbara while realising its economic potential.

The top four outcomes that will be delivered are:

1. Landscape-scale conservation through improved management of key threats

The exceptional terrestrial biodiversity of the Pilbara will be protected and improved through collaborative action on a landscape scale to manage fire and to address the threats posed by feral animals and weeds, which extend across property boundaries. A coordinated and cross-tenure approach to managing feral animals and weeds, and the use of fire as a management tool, will improve conservation of native species and communities, as well as primary production, soil health, water quality, drought tolerance and improved resilience to climate change. The Fortescue Marsh, a nationally significant wetland that supports endemic flora, threatened fauna and a rich diversity of aquatic and terrestrial invertebrates and nomadic and migratory waterbirds, is one example of an important ecosystem that will benefit from improved cross-tenure management of fire, feral animals and weeds.

2. Improved condition of threatened and other important species and communities

The Pilbara supports threatened species and communities listed under State and Commonwealth legislation. These include threatened species, such as the bilby (*Macrotis lagotis*), northern quoll (*Dasyurus hallucatus*), Pilbara olive python (*Liasis olivaceus barroni*) and mountain thryptomene (*Thryptomene wittweri*); ecological communities such as the Themeda grasslands on cracking clays on Hamersley Station, and the stygofauna community in the Ethel Gorge aquifer; and other important ecosystems like Fortescue Marsh. Improved monitoring of threatened and other important species and communities, complemented by targeted research to improve the management of threats, will be delivered across the landscape. The information gained from monitoring and research will be used to adapt management strategies, to ensure relevancy and effectiveness of management decisions. Intensive management of threats and monitoring of threatened species in the central Hamersley Range, including creation of a wildlife sanctuary in Karijini National Park, will provide additional safeguards for threatened species, and assist the recovery of declining wild populations.

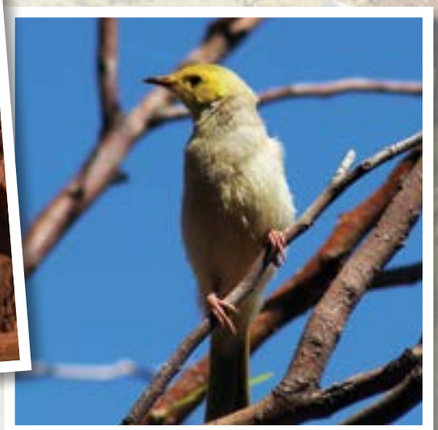
3. Evidence-based conservation management

Understanding the ecological requirements and pressures on biodiversity values is critical to developing appropriate and effective management actions. The rapid expansion of exploration and development in the Pilbara has supported increased ecological research, however, targeted research to better address knowledge gaps is required to guide the management and recovery of species and communities. Such knowledge gaps include determining the key ecological factors influencing the distribution and persistence of threatened and other important species and communities, how they respond to threatening processes and the strategies employed to address them. An improved understanding of the threats to biodiversity in the Pilbara will help determine appropriate management regimes to maintain and improve biodiversity in the region and counterbalance impacts.

4. Conservation through partnerships

Achieving long-term biodiversity conservation outcomes across the vast Pilbara landscape is only possible through partnerships. This strategy's approach to conservation at a landscape-scale will create significant opportunities for partnerships between the State Government and the mining industry, traditional owners, natural resource management groups, pastoralists, local government and research institutions to work together to deliver conservation outcomes throughout the region. The landscape-scale management of key threats along with work to improve the condition of species and communities will create opportunities for traditional owners in managing their lands. Developing and fostering relationships will facilitate the implementation of conservation actions across different tenures and deliver long-term biodiversity benefits.

Main Millstream Chichester National Park. Photo – Judy Dunlop.
Inset left Dragonfly. Photo – Val English



Main Pilbara termite mound. **Inset above left** Rothschilds rock wallaby. Photos – Judy Dunlop
Inset above right White-plumed honeyeater. Photo – Adrienne Markey **Background** Roy Hill rail line. Photo – Judy Dunlop

Scope

This strategy outlines a high-level approach to biodiversity conservation across the vast Pilbara landscape. It identifies outcomes and implementation priorities, recognising that long-term conservation will be most effective at a landscape-scale, achieved by working across tenure boundaries.

This strategy will be implemented across the Pilbara bioregion (as identified in the Interim Biogeographic Regionalisation of Australia, or IBRA), comprised of the local government areas of Karratha and, in part, Ashburton, East Pilbara, Meekatharra and Port Hedland. Generally, actions will only be funded within the Pilbara bioregion, although there may be instances where a significant biodiversity benefit to the Pilbara bioregion is derived from actions in adjoining bioregions (for example, feral animal and weed control).

Protecting the values of the Pilbara will require a coordinated, long-term approach. This strategy identifies the key conservation opportunities and challenges facing the region, and builds on the recommendations of experts and stakeholders, including those provided in the Environmental Protection Authority's (EPA) advice on the cumulative environmental impacts of development in the Pilbara (EPA, 2014), CSIRO's 2014 cost-benefit analysis of conservation strategies for threatened species (Carwardine *et al*, 2014), Pilbara Corridors' 2016 bioregional conservation action planning process (Heydenrych *et al*, 2016), and threatened species research priority workshops.

State Government agencies, traditional owners, non-government organisations, mining companies, local governments, research institutions, pastoralists and individuals are all involved in conservation of the Pilbara. This strategy recognises and complements existing important conservation programs and strategies already being implemented in the Pilbara and serves to sustain the conservation gains achieved by them. This includes management of conservation reserves and former pastoral leases, and initiatives such as ecologically sustainable rangeland management planning through the Fortescue Catchment project undertaken by Pilbara Corridors, feral herbivore management by the Pilbara Recognised Biosecurity Groups, weed management coordinated by the Pilbara Mesquite Management Committee, and a number of projects focused on threatened species or high value biodiversity assets implemented through existing offset agreements by development proponents in collaboration with the Department of Biodiversity, Conservation and Attractions (DBCA).

This strategy identifies long-term strategic priorities, integrating multiple funding sources to deliver conservation outcomes that protect and enhance the biodiversity of the Pilbara. It will be reviewed at the discretion of the Western Australian Minister for Environment no later than 2030.

Pilbara Environmental Offsets Fund

In July 2016, the Western Australian Government approved the establishment of the Pilbara Strategic Conservation Initiative, now known as the Pilbara Environmental Offsets Fund, to maximise the value of environmental offsets from major resource and infrastructure projects that are approved for the Pilbara. The Fund was established in response to recommendations from the EPA for a strategic, coordinated approach to the application of environmental offsets to achieve broad-scale biodiversity conservation outcomes, in accordance with a strategic plan for biodiversity conservation in the Pilbara (EPA 2014). The Fund pools environmental offsets for resource and infrastructure projects approved under the *Environmental Protection Act 1986* (EP Act) which are conditioned in accordance with the WA Environmental Offsets Policy and associated guidelines (Government of Western Australia 2011; 2014). Offsets contributed to the Fund will be used to implement conservation projects that counterbalance the significant residual impacts of those developments at a landscape level.

The Fund provides the opportunity to:

- implement coordinated, sustained landscape-scale actions that identify and focus on the highest priority biodiversity conservation issues and provide targeted and enduring outcomes
- provide proponents with a practical mechanism to fulfil their environmental offset requirements in a transparent, accountable and coordinated manner
- further contribute to significant partnerships between government, industry, landholders, traditional owners, non-government organisations and the broader public.

The Fund will be non-statutory, Government-administered, and held in a special purpose account, established by the Department of Water and Environmental Regulation and managed in accordance with the *Financial Management Act 2006* and Treasury Instructions. The Fund will provide the means for proponents to fulfil their offset conditions requiring contribution to a fund to offset significant residual impacts for their project, and Proponent Contribution Agreements will provide accountability and transparency. Projects funded will address the priorities outlined in the Pilbara Conservation Strategy and project development will address matters including partnerships, scheduling, procurement, funding arrangements, performance measures and reporting requirements, which will be prepared in consultation with stakeholders. The Minister for Environment will approve projects.

Main 14 Mile Pool, Fortescue Marsh. Photo – Adrienne Markey
Inset above Spinifex hopping mouse. Photo – Judy Dunlop

Legend
Pilbara IBRA region boundary
IBRA subregion boundary
Sealed road
Unsealed road
River
Parks and Wildlife-managed estate
CALM Act section 5(1)(g) reserve
Conservation park
Former pastoral lease
National park
Nature reserve
Other lands
Aboriginal reserves
Fortescue Marsh
Other Crown reserves
Pastoral leases
Unallocated Crown land
Pilbara Region
0 25 50 75 100 125 150
kilometres
INDIAN OCEAN
ROEBOURNE SUBREGION
ROEBOURNE SUBREGION
CHICHESTER SUBREGION
HAMERSLEY SUBREGION
FORTESCUE SUBREGION
Murujuga National Park
Millstream Chichester National Park
Mungaroona Nature Reserve
Cane River Conservation Park
Karijini National Park
Port Hedland
Dampier
Karratha
Roebourne
Marble Bar
Pannawonica
Onslow
Exmouth
Exmouth Gulf
Nullagine
Tom Price
Paraburdoo
Newman
NORTHERN HIGHWAY
GREAT NORTHERN HIGHWAY
MARBLE BAR ROAD
RIPON HILLS ROAD
NORTH WEST COASTAL HIGHWAY
NANUTARRA MUNJINA ROAD
CHICHESTER RANGE
HAMERSLEY RANGE
Fortescue Marsh

The Pilbara

Land use

The resident population of the Pilbara in 2014-15 was estimated at almost 66,000 people, with Aboriginal people comprising about 16 per cent. Aboriginal people have inhabited the Pilbara for more than 40,000 years and the region has world-renowned rock art, recording continuous human cultural history in the Pilbara. The region has more than 31 language groups comprising people who have a strong spiritual, physical and cultural connection to Country.

The Pilbara is important to the economic development of Australia due to its internationally significant deposits of minerals and the processing of liquefied natural gas. Pilbara iron ore sales in 2015-16 totalled over $46.6 billion, representing 96 per cent of the State's iron ore sales and 53 per cent of the State's mining and petroleum sales value. Mining provides employment for 18,500 people in the Pilbara and mining tenements cover 70 per cent of the region.

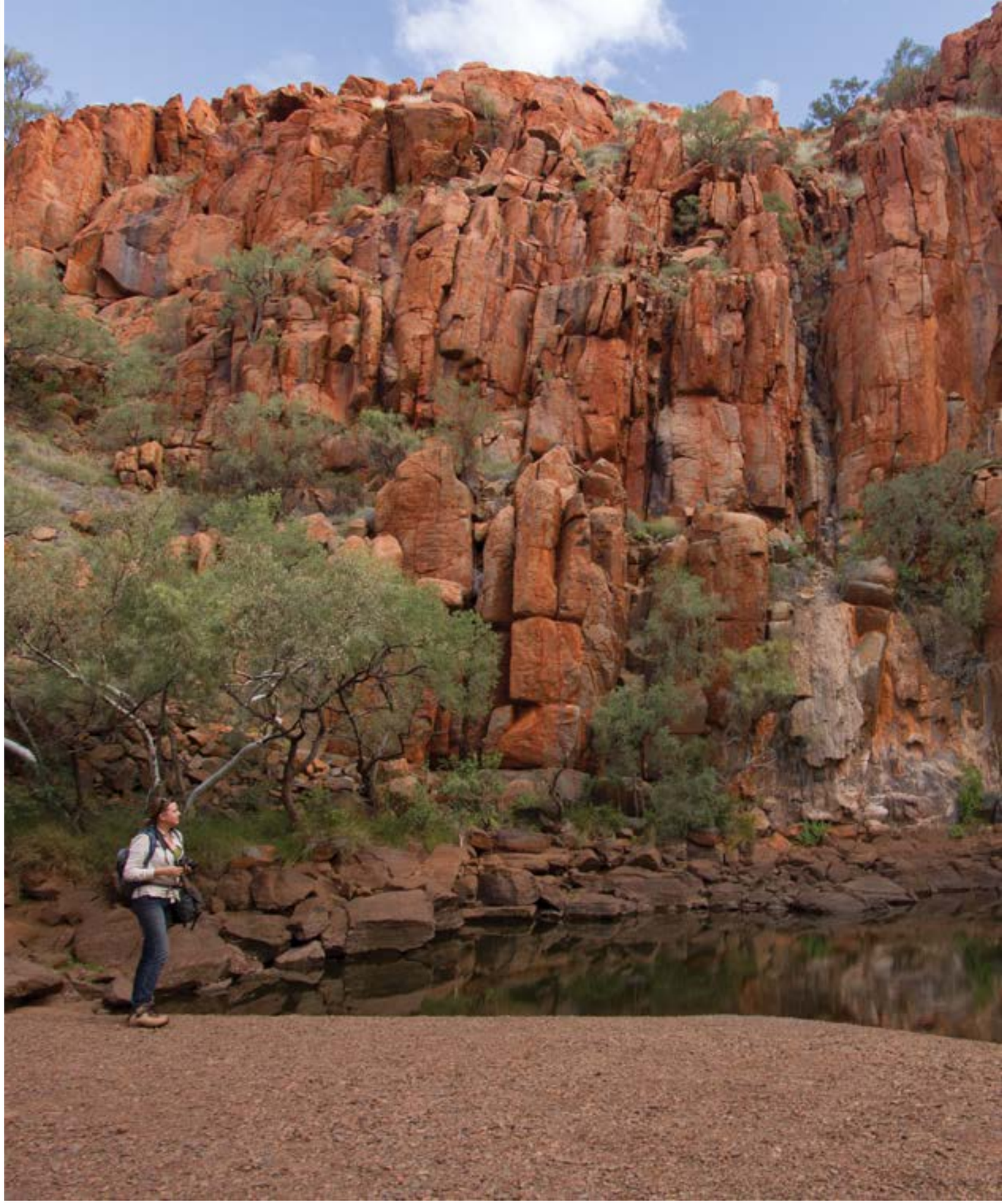
Liquefied natural gas is largely sourced from Commonwealth waters off the Western Australian coast, but most processing occurs within the Pilbara. In 2015-16, the State's liquefied natural gas sales were valued at over $10.7 billion.

Almost 60 per cent of the Pilbara is pastoral land and is primarily focused on commercial cattle grazing. The Pilbara pastoral industry was valued at $83.5 million in 2013-14.

The conservation reserve system covers six per cent of the region, whereas a target of 17 per cent of land in conservation reserve is considered necessary to protect biodiversity (Convention on Biological Diversity, 2010). Pilbara conservation reserves include Karijini National Park, Murujuga National Park, Millstream Chichester National Park, Mungaroona Nature Reserve, the Dampier Archipelago island reserves and Cane River Conservation Park. These reserves help support a growing tourism industry that attracted more than 820,000 visitors to the Pilbara in 2015, with tourism contributing more than $578 million to the regional economy. Karijini and Millstream Chichester national parks are among the best known parks in Australia and flagship tourism destinations.

Unallocated Crown land comprises 28 per cent of the Pilbara. Sixteen per cent of this land is former pastoral lease that has been purchased, or acquired as exclusions under the 2015 pastoral lease renewal program, for inclusion in the conservation reserve system. Three per cent of the region is held in Aboriginal reserves.

[1]For the subregions, representation is 3.94% for Chichester, 0.55% for Fortescue, 12.96% for Hamersley and 3.71% for Roebourne.



Main Python Pool, Millstream Chichester National Park. **Inset above left** Aboriginal rock art of quoll. **Inset above right** Pilbara iron ore rail. **Background** Cattle muster. Photos – Judy Dunlop

Biodiversity values

There are four terrestrial subregions of the Pilbara: the coastal and alluvial plains and offshore islands (Roebourne), the Pilbara tablelands and granitic plains (Chichester), the banded ironstone ranges and uplands (Hamersley), and the low-lying alluvial flats (Fortescue). River systems, including the De Grey, Turner, Yule, Robe and Fortescue, are prominent features of the landscape driven largely by cyclone-derived rainfall over summer.

The coastal plains of the 1,862,236 hectare Roebourne subregion feature low relief headlands, deltas, barrier islands and lagoons with mangroves, samphire flats, tidal algal mats, sandy beaches and rocky shores. Extensive alluvial terraces and wash plains are associated with river frontages and pindan plains. Vegetation is mainly mixed tussock grass and acacia shrublands with uplands dominated by spinifex (*Triodia* spp.). Many Pilbara islands, including those of the Dampier Archipelago, are free of introduced predators and support populations of threatened species, including the Airlie Island ctenotus (*Ctenotus angusticeps*), nesting sea turtles and migratory birds. The Burrup Peninsula (Murujuga) has a high diversity of restricted plants and distinct vegetation assemblages, diverse fauna including the threatened Pilbara olive python and endemic land snails. The Dampier Archipelago (including Burrup Peninsula) is a National Heritage site, with the largest collection of petroglyphs (rock engravings) in the world.

The Chichester subregion — the northern portion of the Pilbara Craton — covers almost half of the Pilbara bioregion (8,374,728 hectares). It features the Chichester Range, which stretches for more than 400 kilometres, and the granitic plain and tor field of the Abydos Plain. Vegetation is dominated by shrubby acacia species over spinifex (*Triodia wiseana*) on the plains, with open tree-steppe of snappy gum (*Eucalyptus leucophloia*) over hummock grasses on the ranges. The Chichester Range supports nationally-listed threatened species such as the bilby, northern quoll, Pilbara leaf-nosed bat and ghost bat (*Macroderma gigas*). Numerous endemic reptile and plant species have also been recorded in the subregion.

The mountainous Hamersley subregion covers 5,634,727 hectares. It is dominated by snappy gum over hummock grass in the north, acacia shrublands over hummock grass on the lower stony slopes and low mulga (*Acacia aneura*) woodlands on the fine soils of valley floors in the south. The gorges and summits of the highest peaks of the Hamersley Range protect isolated populations of land snails, skinks and plants, while the aquifers of the plains have high species endemism and diversity of subterranean fauna, including the threatened blind cave eel (*Ophisternon candidum*) and troglobites of the Robe River Valley (*Paradraculoides anachoretus*, *P. bythius*, *P. gnophicola* and *P. kryptus*). Threatened fauna include the bilby, northern quoll, Pilbara leaf-nosed bat, ghost bat and Pilbara olive python. Many endemic plant species, including threatened species such as the Paraburdoo heath (*Aluta quadrata*), and rare ecosystems are also present.

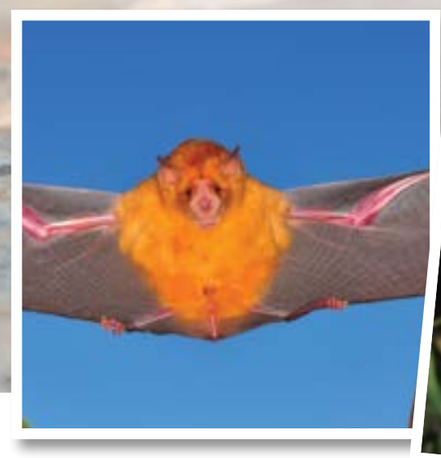
The alluvial plains, saltmarsh and seasonal wetlands and river systems of the Fortescue Valley, which drain the Hamersley and Chichester ranges, form the 1,951,435 hectare Fortescue subregion. At its centre, an extensive saltmarsh supports a unique samphire heath with a fringing apron of shrub, mulga-bunch and short tussock grass, and mulga woodlands at the northern extent of their continental range. Western coolibah (*Eucalyptus victrix*) woodlands line temporary drainage lines while river red gum (*E. camaldulensis*) and cajuput (*Melaleuca argentea*) forest fringe the permanent waterways. The Millstream wetlands extend for more than 40 kilometres and include large, deep pools and extensive wetland and riverine vegetation. The diverse aquatic invertebrate community is rich in endemic species, especially in the Millstream aquifer. The Millstream fan-palm (*Livistona alfredii*) only occurs at Millstream and a few scattered wetlands across the Chichester and Hamersley subregions. The threatened northern quoll, Pilbara olive python, bilby and Pilbara leaf-nosed bat occur in the subregion, and possibly also the critically endangered night parrot (*Pezoporus occidentalis*), with suitable habitat for the night parrot also found elsewhere in the Pilbara.

The Fortescue subregion contains the Fortescue Marsh, the largest seasonal wetland in the Pilbara, and one of the region's six nationally significant wetlands. When in flood, Fortescue Marsh supports large-scale waterbird breeding, and provides habitat for nomadic and migratory birds protected under international agreements and listed under the *Environment Protection and Biodiversity Conservation Act 1999*. Fortescue Marsh is also recognised in Western Australia as a Priority Ecological Community and an environmentally sensitive area under the EP Act. Other Pilbara wetlands of national significance are the Karijini Gorges, Leslie Saltfields system, Millstream Pools, De Grey River and the Mt Bruce coolibah-lignum flats.

The Pilbara is one of only 15 national biodiversity hotspots. The region has high species richness and many endemic species of plants and animals, including one of the richest reptile assemblages in the world, more than 125 species of acacia, and more than 1000 species of aquatic invertebrates.

The Pilbara is an international hotspot for subterranean fauna. More than 3000 species occur across the landscape, in most types of geological and hydrological settings, with levels of endemism of up to 98 per cent for stygobites and high species turnover across relatively short distances.

Threatened ecological communities in the Pilbara include the Themeda grasslands on cracking clays on Hamersley Station and the stygofauna community in the Ethel Gorge aquifer. Additional communities are of conservation concern. More than 170 species of threatened or poorly known flora occur in the region, including the nationally-listed threatened species mountain thryptomene (*Thryptomene wittweri*) and Hamersley lepidium (*Lepidium catapycnon*), and the State-listed species of Declared Rare Flora *Pityrodia* sp. Marble Bar and Paraburdoo heath (*Aluta quadrata*).



Main Pilbara olive python. Photo – Judy Dunlop. **Inset above** Freshwater claypans, Mulga Downs. Photo – Jill Pryde
Inset right Pilbara leaf nosed bat. Photo – Mark Cowan. **Inset far right** Chinnock (*Eremophila lanceolata*). Photo – Adrienne Markey

Conservation challenges

While the Pilbara has significant biodiversity values, widespread declines in biodiversity have occurred through pressures such as the replacement of traditional Aboriginal burning practices with more frequent and intense fire regimes, introduced predators, competition from grazing livestock and weeds, altered hydrology, and habitat fragmentation associated with land degradation and clearing.

Much of the Pilbara vegetation is well adapted to fire and many species require fire as part of their life cycle. Traditional Aboriginal burning practices created a patchwork of vegetation of different ages across the landscape, a practice that regulated fuel loads and minimised the occurrence of large, intense wildfires. A mix of vegetation of different ages provides habitat, food and protection from predators for many reptiles and small to medium-sized mammals. Changes in fire regimes over the last century have led to more frequent, intense and large-scale bushfires, and are believed to be one of the primary causes of decline and extinctions of medium-sized mammals in arid Australia (in the Pilbara at least 12 mammal species have become extinct over the past two centuries). Altered fire regimes also threaten Aboriginal heritage values. Large-scale intense fires can be difficult to control and can result in loss of life and property and impact on commerce and business.

Introduced herbivores such as camels, donkeys, horses and unmanaged cattle are now widespread in the Pilbara. They can compact soil, cause erosion, spread weeds, and trample and graze vegetation, leading to reduced habitat and food resources for native animals and exposing them to increased risk of predation. Trampling and high livestock numbers may lead to eutrophication, erosion and sedimentation of wetlands, rivers and streams and their fringing vegetation. Most of the gently undulating and lowland plains of the Pilbara mainland, including conservation reserves and some important grassland ecosystems, are prone to grazing by feral herbivores. Impacts from native herbivores, such as red kangaroos (*Macropus rufus*) and euros (*Macropus robustus erubescens*), may also exist, especially where artificial watering points provide the opportunity for native and feral herbivore populations, along with domestic livestock, to persist at densities higher than the rangeland can sustain. Rabbits also alter the landscape through overgrazing and burrowing, competing with native species such as the bilby.

Feral cats are widespread across the Pilbara, while the European red fox appears to be confined to the coastal fringe and hinterland plains, extending inland along the larger drainage systems. These introduced predators are responsible for range reductions and population declines in many native animals. Hitchhiker cane toads occasionally arrive in the Pilbara in freight or shipping containers, or in vehicles with tourists, and are promptly destroyed upon detection. Feral pigs, confined to the vegetation along the De Grey River, also predate native wildlife, degrade habitat and spread weeds. Aquatic introduced predators, including the redclaw crayfish (*Cherax quadricarinatus*), are present in wetlands across the region where they predate and compete with native freshwater species and may introduce diseases.

Weeds are another major threat in the Pilbara and are often associated with inappropriate fire and grazing regimes, as well as urbanisation, mining and pastoral activities. They alter fire patterns, modify soil characteristics, compete directly with native species and modify habitat for native wildlife. The most significant weeds are ecosystem transforming, including invasive grasses such as buffel grass; woody perennials such as mesquite (*Prosopis* spp.), parkinsonia (*Parkinsonia aculeata*), calotropis (*Calotropis procera*) and date palms (*Phoenix dactylifera*); and the invasive vine stinking passionflower (*Passiflora foetida* var. *hispida*). These weeds threaten particular habitats, especially wetlands and islands, or proliferate in disturbed areas, presenting a challenge for land rehabilitation and revegetation programs. The potential exists for species such as prickly pear (*Opuntia* spp.), leucaena (*Leucaena leucocephala* subsp. *leucocephala*) and Rhodes grass (*Chloris gayana*) to become major threats to biodiversity due to inadequate biosecurity protocols, associated with intensive agricultural developments and garden escapes, or altered climatic regimes.

The construction of infrastructure corridors and vegetation clearing associated with development may also result in habitat loss, interrupt overland surface water flows and fragment habitat, which can affect landscape connectivity, vegetation condition and the resilience of animal populations (from increased mortality through encounters with plant and machinery).

Projected changes in rainfall, temperature and frequency of extreme weather events associated with climate change will affect the Pilbara, in particular, the magnitude or duration of extreme events. Altered species distributions, inundation due to sea level rise, and altered fire regimes due to increased fuel loads may potentially affect the region, however, their extent and interactions with other ecosystem processes are poorly understood.

Main Mosaic burning in the Pilbara. Photo – Judy Dunlop **Inset top** The stinking passionflower weed. Photo – Val English **Inset above** Feral cat. Photo – Judy Dunlop

Evidence-based management

With the rapid expansion in exploration and development in the Pilbara, a large number of ecological surveys and research projects have been, and continue to be, commissioned to generate valuable data on the region's environmental values. These surveys have led to the discovery of new plant and animal species, a greater understanding of the distribution and ecology of some species and communities and an appreciation of the evolutionary history of the Pilbara.

The rapid expansion of the mining industry in the Pilbara over the past two decades led to concerns about environmental issues and impacts to biodiversity associated with such development. These concerns identified inadequacies in knowledge required for land use planning, impact assessment and natural resource management.

The Pilbara Biological Survey was undertaken between 2002 and 2007 to gain greater knowledge of the region's biodiversity to underpin future conservation planning and sustainable land use for the Pilbara. Key findings were published in the *Records of the Western Australian Museum Supplement 78*. www.museum.wa.gov.au/research/records-supplements/supplements/supplement-78.

Despite considerable survey effort, there are significant gaps in knowledge about the biota of the Pilbara and the pressures that threaten them. A large number of new species have been described in recent years, indicating a need for more taxonomic investigation. Greater knowledge is required about the key ecological factors influencing the distribution and persistence of threatened and other important species and communities and how they respond to threatening processes. Targeted and prioritised applied research will provide the knowledge necessary to support sustainable resource development decisions and biodiversity conservation planning and management.

Immense traditional ecological knowledge has been handed down from generation to generation and this can be used in conjunction with modern science to inform land management practices and decisions.

Working in partnership

The community plays an important role in conserving the Pilbara's biodiversity. State Government agencies, the mining industry, traditional owners, pastoralists, natural resource management groups, local government, non-government organisations, research institutions and the general community all participate in actions to deliver conservation outcomes.

Non-government and community organisations deliver a range of conservation-based programs, including environmental awareness raising, wildlife monitoring and on-ground management, to achieve conservation outcomes. The Pilbara Corridors program, a partnership between Rangelands NRM, Greening Australia and DBCA is managing biodiversity threats in the Pilbara by providing advice and counsel to pastoral, mining, conservation and Aboriginal land managers regarding sustainable land management practices.

Traditional owners have a cultural responsibility to care for their country which they have done for thousands of years. Recent initiatives include the development of Healthy Country Plans by several language groups.

Mining companies are actively involved in managing the Pilbara environment, particularly in localities on or close to their operations where they are responsible for implementing actions, including research, on-ground management and monitoring, to fulfil their environmental responsibilities. Several companies also own pastoral leases and endeavour to sustainably manage the rangelands for cattle production while maximising beneficial outcomes for biodiversity.

State Government agencies undertake direct actions to conserve biodiversity. DBCA manages the conservation reserve system in the Pilbara, along with former pastoral leases of high conservation value; implements threatened species and important habitat conservation programs, including research on the northern quoll, bilby, Pilbara olive python, Pilbara leaf-nosed bat, and the efficiency and effectiveness of feral cat baiting; and investigates the status of potentially significant species and ecosystems. The Department of Primary Industries and Regional Development and Recognised Biosecurity Groups actively eradicate feral animals and weeds and assist in assessing rangeland condition on pastoral leases. The State departments of Water and Environmental Regulation, and Mines, Industry Regulation and Safety, and the Commonwealth Government Department of the Environment and Energy play important roles in managing the environmental impacts of natural resource extraction and infrastructure development activities in the Pilbara. Local government and the Department of Planning, Lands and Heritage also play a role in land management in the Pilbara.

Main Volunteers setting fauna traps. **Far left** Stripe-tailed monitor (*Varanus caudolineatus*). **Inset above left** Welcome to country. Photos – Judy Dunlop **Inset above** Park managers meeting with traditional owners, Millstream. Photos – Val English

Pilbara priorities

The following priority areas will be the focus of projects implemented to meet the objectives and key outcomes of this strategy, along with additional targeted projects as required.

Karijini restoration

The central Hamersley Range, encompassing Karijini National Park, adjacent pastoral leases and unallocated Crown land, comprises a variety of ecosystems that support threatened species, including the northern quoll, Pilbara olive python, Pilbara leaf-nosed bat, ghost bat and mountain thryptomene. These species and ecosystems are threatened by development, feral herbivores, feral cats, weeds and inappropriate fire regimes. The following actions will help restore the central Hamersley Range and enhance biodiversity and ecosystem resilience:

- Eradicating or controlling feral herbivores, particularly donkeys, horses and unmanaged cattle, via direct removal and strategic fencing to protect priority assets, and monitoring the effectiveness of this control on vegetation condition and native fauna populations.
- Controlling feral cats, including baiting and trapping, and monitoring the effectiveness of this control on threatened species and communities.
- Removing priority weeds from high value assets, with monitoring and follow up treatment as required.
- Managing fire through prescribed burning for biodiversity, informed by research and monitoring.
- Undertaking research to address key knowledge gaps, such as determining the key ecological factors influencing the condition of threatened and other important species and communities, and monitoring how these species and communities respond to threatening processes and the strategies employed to mitigate them.
- Establishing a wildlife sanctuary within Karijini National Park, free of introduced animals and other threatening processes, for threatened animals of the Pilbara. The sanctuary could provide a source for other translocations as necessary.

Restoration of the central Hamersley Range will provide an opportunity for partnerships between DBCA, local government, traditional owners, pastoralists, natural resource management organisations and mining companies.

Main Mountain thryptomene. Photo – Val English **Inset left** Circular pool. **Inset centre left** Banded ironstone. Photos – L-A Shibish **Inset far left** Bilby monitoring. Photo – Judy Dunlop

Fortescue Marsh

The Fortescue Marsh, a wetland of national significance, is an ecological community that sustains a rich diversity of aquatic and terrestrial invertebrates, nomadic and migratory birds, threatened species including the bilby and night parrot, and a number of endemic and poorly known plant species. Overgrazing and soil erosion caused by feral herbivores, predation by feral cats, competition from weeds and inappropriate fire regimes, combined with human impacts, threaten the biodiversity of the marsh. The following actions will help the Fortescue Marsh recover from these cumulative impacts:

- Eradicating feral herbivores, particularly donkeys, horses and unmanaged cattle, via direct removal and exclusion fencing, and monitoring the effectiveness of management techniques on vegetation condition and native fauna populations.
- Eradicating rabbits through the release of rabbit hemorrhagic disease virus and subsequent monitoring of bilby habitat.
- Controlling feral cats by baiting and trapping, and monitoring the effectiveness of this control on threatened species and communities.
- Removing priority weeds, including parkinsonia, from priority assets, with monitoring and follow up treatment as required.
- Managing fire through prescribed burning for biodiversity, informed by research and monitoring.
- Undertaking research to address knowledge gaps for effective implementation of conservation management.
- Progressing the addition of the Fortescue Marsh to the conservation reserve system through the negotiation and implementation of Indigenous Land Use Agreements and joint management plans with traditional owners.

Partners with an interest in the recovery of Fortescue Marsh include DBCA, traditional owners, natural resource management organisations, mining companies and research organisations.

Pilbara fire

Frequent, large, intense fires threaten biodiversity across the Pilbara, affecting a suite of native species. A prescribed burning program for the Pilbara will achieve a range of benefits including the conservation and enhancement of biodiversity; maintenance and improvement of ecosystem health; conservation of soil and catchment values; regeneration and protection of native plants and habitats; and protection of natural and cultural heritage, recreation sites and scenic values.

A landscape-scale cross-tenure prescribed burning program will address fire frequency, intensity and extent to create a mix of vegetation of different ages. Fire management plans will be used to reduce fuel loads around priority assets, high risk areas for ignitions, and fire-sensitive species and communities vulnerable to inappropriate fire regimes.

The program will be informed by targeted research and monitoring into fire ecology and traditional knowledge to determine appropriate fire regimes to improve or maintain biodiversity in the long term. Sharing knowledge about fire behaviour and evaluating fire management activities will further guide adaptive fire management in the region.

Pilbara feral animals and weeds

A variety of feral animals and weeds affect the Pilbara on a landscape scale, and a region-wide approach to their control is required to achieve significant and sustainable conservation benefits. Eradication and control of feral animals and weeds will be undertaken on a species and site-led basis. Priorities will be identified based upon species invasiveness, ecological impact, potential and current distribution and feasibility of control. Eradication will be the target for new infestations and/or introductions in the region and for species with populations small enough to achieve eradication. Management of invasive species that are impacting on high value conservation assets, including threatened and other important species and communities, will be a high priority.

A Pilbara-wide feral animal management plan will identify and rank species for control (and eradication where feasible), and identify priority sites for control.

The feral animal management program will address:

- feral herbivore control and cattle grazing and guide on-ground actions, such as fencing for controlling stock, to protect priority conservation assets. Monitoring and evaluation of management actions, including region-wide condition monitoring, and sharing of knowledge, will inform adaptive management of feral herbivores. Eradicating pigs from the De Grey River will reduce predation of native species and habitat alteration and effectively remove this pest from the Pilbara.
- broad-scale cat baiting and localised trapping campaigns at strategic locations to protect priority conservation assets. The program will be underpinned by research into the effectiveness of different bait and trap types, the interactions between wild dogs, dingoes, foxes and cats and the impacts of reductions in numbers of one of these predators on the others (mesopredator release) and the relationship between baiting regimes, introduced predator density and predator impact to determine appropriate baiting regimes for species being targeted for recovery and changing environmental conditions.
- eradication of redclaw crayfish from wetlands in Karijini and Millstream Chichester national parks and other natural wetlands with high biodiversity values across the region.

Researching and monitoring the condition of threatened and other important species and communities and their response to control measures will enable evaluation of management effectiveness, early detection of emerging threats to the Pilbara's biodiversity, and guide adaptive management.

A Pilbara-wide integrated weed management strategy will identify the highest risk weed species and the key conservation assets around which weed control will be prioritised. The priority weeds will be removed or managed and monitored, with follow up treatment as required. Priorities may include:

- eradication of parkinsonia from the Fortescue River catchment
- eradication of town escapes, which include leucaena and several exotic palms, from drainage catchments in the vicinity of Tom Price
- management of stinking passionflower on the Burrup Peninsula and in Millstream Chichester National Park
- management of mesquite in the Robe and Fortescue river catchments
- long-term eradication of date palms from the Pilbara.

Targeted research to inform on-ground management and ongoing surveillance and monitoring will further guide and improve a sustainable adaptive weed management program for the region.

Protecting and enhancing the Pilbara's biodiversity through control of feral animals and weeds will involve many partners, including State Government agencies, the mining industry, traditional owners, pastoralists, natural resource management groups, local government, research institutions and the general community.

Main Feral camels on the Fortescue Marsh. Photo – Hamish Robertson
Inset right Weeli wolli. Photo – Val English **Inset far right** Prescribed burning at Millstream Chichester National Park. Photo – Marko Serra

Implementing this strategy

Resources

Partnerships between the State Government and the mining industry, traditional owners, natural resource management groups, pastoralists, local government and research institutions will be essential to implement this strategy. Current government and natural resource management resources are being used to progress some of the conservation outcomes outlined in this strategy, and the Pilbara Environmental Offsets Fund provides a mechanism to pool resources and implement priorities identified in this strategy to counterbalance the significant residual impacts of development. Efforts will be made to encourage complementary investment by the Commonwealth Government, industry, research organisations, non-government organisations, community groups and other stakeholders consistent with this strategy.

Principles

The following principles will be applied to implement this strategy:

- *Landscape-scale approach*. Recognise that effective biodiversity conservation operates at the landscape level across boundaries and tenures.
- *Outcome-focused*. Ensure actions identify, measure and focus on achieving targeted and sustainable on-ground outcomes.
- *Adaptive management*. Manage the natural environment using the best available knowledge, learning from outcomes and adapting accordingly and in response to changing conditions to deliver enhanced species and ecosystem resilience.
- *Offset impacts of development*. Implement actions that counterbalance the significant residual impacts of development in the Pilbara.
- *Maximise effort through partnerships*. Recognise that conservation management will be most effective and sustainable where it is undertaken in partnership with relevant land managers and other collaborators.
- *Respect for Aboriginal people*. Respect the rights, roles and aspirations of Aboriginal people and their deep connection to their traditional lands.
- *Long-term benefits*. Implement actions that will result in the highest long-term benefits for biodiversity conservation.
- *Share knowledge*. Ensure knowledge and learning is shared and made available in a timely manner.

Measuring success

Understanding how projects and on-ground actions in the Pilbara are achieving the biodiversity conservation outcomes identified in this strategy is critical to ensure that the actions are appropriately targeted to maximise conservation outcomes.

A monitoring and evaluation process will involve periodic reviews to ensure the latest science and lessons learnt from on-ground projects inform management priorities and appropriate implementation actions.

The success of this strategy will be assessed by the evaluation of factors influencing biodiversity values. Such measures may include:

- condition of selected threatened and other important species and ecological communities;
- vegetation condition;
- area and density of selected high priority weeds; and
- absence of selected introduced animals in key areas.

A performance reporting program will be established under this strategy to further develop these measures.

Main Cane River Conservation Park. Photo – Judy Dunlop
Inset above Mulla-mulla, Karijini National Park. Photo – Val English
Right Zebra finch. Photo – Judy Dunlop

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Main Karijini National Park.
Photo – Judy Dunlop

Front cover Karijini. Photo – Val English
Back cover Coolibah flats, Mt Bruce. Photo – Jill Pryde

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