

Forest Management Plan 2024–2033

December 2023



Conservation and Parks Commission and
Department of Biodiversity, Conservation and Attractions

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Conservation and Parks Commission
Department of Biodiversity, Conservation and Attractions

Forest Management Plan 2024–2033

December 2023



Boranup Karri Forest – Tourism Western Australia

Foreword

As a community, we have entered an era which requires us to rethink our approach to attitudes and behaviours that most people considered adequate in the past. The way that humans interact with native forests affected by hotter and drying climates is now a world-wide concern. Locally, the conservation of the native forests of south-west Western Australia poses a challenge for government, industry, and community.

Since the Western Australian Government's announcement to end large scale commercial timber harvesting in south-west native forests, the world has experienced extreme climatic events such as unprecedented catastrophic wildfires, extensive flooding, and extreme heat. Western Australia's south-west is a region that exemplifies the clash between global biodiversity and climate-induced drying. Climate change is increasing pressure on every ecosystem in Australia, posing challenges for management of our natural environment, national parks and biodiversity. The direction and range of projected climate change is uncertain, and it is imperative we continue to build knowledge and refine management of climate impacts on our forest ecosystems.

This plan is informed by the latest science that has been strengthened through collaboration and partnerships. The plan provides flexibility to respond to future management challenges in changing times by feeding monitoring and research results into an adaptive management approach. Increasing our understanding of intervention techniques allows for informed decisions about managing current and future climate risks based on credible, up-to-date, useable, and relevant information.

In addition to the extensive consultation undertaken, an additional component of plan development has been environmental impact assessment under the *Environmental Protection Act 1986*. This assessment process has resulted in changes to the plan which will ultimately strengthen its implementation.

The plan facilitates consultation with traditional owner partners and community stakeholders to share knowledge and commits to ongoing engagement on how the Conservation and Parks Commission monitors its implementation and how the Department of Biodiversity, Conservation and Attractions undertakes forest management activities. Partnerships with traditional owners under the South West Native Title Settlement present exciting opportunities to incorporate Noongar knowledge into active forest management. Our south-west forests are also an important destination for recreation and tourism, and there is a need to balance the provision of enjoyable, enriching visitor experiences with the conservation and protection of other values and uses.

The *Forest Management Plan 2024-2033* provides the policy and framework to protect and manage forests in Western Australia's south-west national parks, conservation parks, nature reserves, State forests and timber reserves. This plan is at the forefront of utilising contemporary management intervention techniques to reduce the severity of climate-induced changes to forest ecosystems. I am confident that it outlines the suite of necessary and appropriate activities to manage our forests for increased health and resilience, including mitigating the impacts of a warming, drying climate, for the 10-year term of the plan.

Managing our forests as complex and dynamic ecosystems to deliver ecological, economic, and social benefits into an uncertain future is a challenge. But uncertainty should not stand in the way of action.

Professor Chris Doepel PSM

Chair, Conservation and Parks Commission



Koomal – DBCA

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“Protecting and managing our south-west forests for the benefit and enjoyment of current and future generations.”

Tuart tree, Maidens Reserve, Kalgulup Regional Park - Jodie Deely, DBCA



Acknowledgement of country

The Government of Western Australia acknowledges the traditional owners throughout Western Australia and their continuing connection to the land, waters and community. We pay our respects to all members of Aboriginal communities and their cultures; and to Elders past, present and emerging.

In particular, the Conservation and Parks Commission and Department of Biodiversity, Conservation and Attractions acknowledges the Noongar people as the traditional owners within the Forest Management Plan area in the south-west of Western Australia and respects the continuing connection and importance of forests to their cultural, physical and spiritual health.

Forests – Djarlma

When the great Waugal created the boodja (land/country), he ensured that there were wirrin or spirits to look after the land and all that it encompassed. Some places such as the kaart (hills) and ngamar (waterholes), boya (rocks), bilya (rivers) and boorn (trees) were created as sacred sites and hold wirrin, both warra (bad) and kwop (good). Noongar believe that the spirits of their ancestors live in the forests. The ancestral spirits of their demanggar (grandparents) are there to give them their healing and their food. Everything in Noongar boodja has a purpose; if the forests are not preserved and maintained then they will have no ancestral spirits to guide them and give them sustenance and healing, the forest spirits will go to sleep forever and Noongar will become sick in both mind and body.

(Courtesy of the South West Aboriginal Land and Sea Council)

The Department of Biodiversity, Conservation and Attractions commissioned Noongar artist Linda Loo (Linlelu Arts) to create an original artwork for the *Forest Management Plan 2024-2033*. Linda's painting represents the Noongar Seasons in the south-west, and elements of her artwork have been incorporated into the design of this document.



Noongar Seasons © Linda Loo/Copyright Agency 2022



1 New directions for forest use and management



Boranup karri forest, Leeuwin-Naturaliste National Park - Tourism Western Australia

Native forests on public lands, vested in the Conservation and Parks Commission (the Commission), in the south-west of Western Australia are managed in accordance with a *Conservation and Land Management Act 1984* (CALM Act) management plan known as a Forest Management Plan (FMP). The FMP facilitates management of the multiple values and uses of south-west forests, including biodiversity conservation, customary practices, recreation and tourism, water supply and other forest-based industries.

Since January 2014, when *Forest Management Plan 2014-2023* (FMP 2014-2023) commenced, there have been significant changes in government policy settings affecting management of the south-west forests. These are reflected in this FMP for the years 2024-2033 prepared by the Department of Biodiversity, Conservation and Attractions (DBCA, or the department) on behalf of the Commission.

On 25 February 2021 the South West Native Title Settlement (the Settlement) became operational. This is the largest and most comprehensive native title agreement in Australian history and will provide long-term benefits and opportunities for developing Noongar¹ interests. The area covered by the FMP is part of the South West Native Title Settlement Area.

Recent research shows that climate change has had a considerable impact on Australia's natural environment, including the native forests of the south-west. Average temperatures and heat extremes have increased, and the south-west has experienced a 20 percent decrease in May-July rainfall since 1970. Such climatic changes are placing some forest ecosystems under stress, driving tree mortality and localised collapse of forest structure. These trends are forecast to continue in future decades.

¹ Noongar can be spelt in a number of ways: Nyungar, Nyoongar, Nyoongah or Noongah. Noongar is not a written language – it is an oral language, hence the writing of Noongar language is somewhat difficult because of the different ways the words have been spelt over time. One spelling of a Noongar word is not necessarily more correct than another, and in this plan, Noongar is used.

In September 2021, the State Government announced new policy settings relating to the use and management of the south-west forests, which will be reflected and implemented through this FMP.

The most significant change for forest management resulting from these policy changes is the cessation of large-scale commercial timber harvesting in native forests. The only timber to be removed from native forests will be sourced from management activities that improve forest health (such as ecological thinning) or clearing for approved mining operations and infrastructure

Ecological thinning is an active forest management tool that involves the selective removal of individual trees to improve or maintain ecological values and reduce the current and future moisture stress of a given area. Ecological thinning aims to reduce competition between trees and facilitate persistence of the remaining vegetation, thereby maintaining greater structural diversity of habitat types. This may also enhance forest resilience to high-intensity bushfires, help maintain carbon stores, and support the development of tree hollows for a variety of species.

The policy settings also commit to an expansion of the formal conservation estate. Native forests will be preserved as a result of the decision to cease large-scale commercial harvesting. Over the term of *Forest Management Plan 2024-2033* (FMP 2024-2033) at least 400,000 additional hectares of national parks, conservation parks and nature reserves will be created, following consultation with traditional owners, to ensure permanent protection of high conservation value areas.

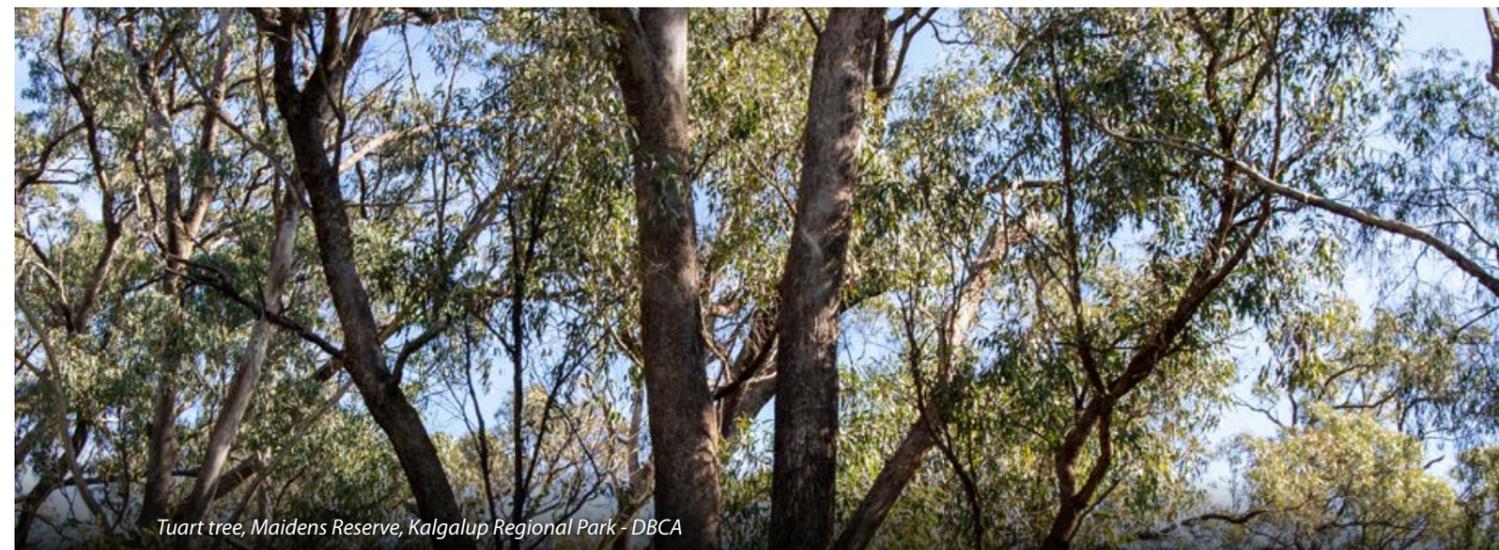
1.1 Noongar involvement in forest management

The Noongar people are formally recognised, through the *Noongar (Koorah, Nitja, Boordahwan) (Past, Present, Future) Recognition Act 2016*, as the traditional owners of the south-west region of Western Australia. This historic Act fulfilled a central condition to the commencement of the Settlement.

Comprising six Indigenous land use agreements (ILUAs), the Settlement was negotiated between the Noongar people and the State Government. The full details of the Settlement are recorded in the six identical ILUAs with the Ballardong, Gnaala Karla Booja, Karri Karak (formerly South West Boojarah), Wagyl Kaip and Southern Noongar, Whadjuk, and Yued groups, made in compliance with the *Native Title Act 1993* (Cth).

The Settlement enables the State Government to work in partnership with the Noongar people to improve economic, social and cultural outcomes for the Noongar community. Six Noongar Regional Corporations represent the rights and interests of each of the six Agreement groups.

The Noongar peoples' strong relationship to their boodjar² (land/country) is reflected in many components of the Settlement package, including the creation of the Noongar Land Estate; recognition of the Noongar people as the traditional owners of the south-west region and a standard heritage process.



Tuart tree, Maidens Reserve, Kalgalup Regional Park - DBCA

² All spelling and use of Noongar words in this plan have been endorsed by the Noongar Boodjar Language Centre.

The South West Conservation Estate (the Estate) covers approximately 3.8 million hectares, a larger extent than the planning area³. The Estate refers to all CALM Act lands and waters within the Settlement Area, including State forests, national parks, nature reserves and other areas set aside for conservation. The department and each of the Noongar Regional Corporations will enter into a Cooperative Management Agreement to cooperatively manage the Estate in each of the Noongar agreement areas. These agreements will acknowledge the continuing cultural, spiritual and social connections of the Noongar people to the region, and their unique traditional knowledge and expertise in the future management of the Estate.

The establishment of these management partnerships, which cover the extent of the planning area, marks a new era of collaboration and provides opportunities to continue to develop the department's forest and fire management practices in the south-west region. The partnerships present exciting land management opportunities and will ensure the south-west forests are cared for using Noongar and Western methods.

1.2 Responding to climate change

In November 2020, the State Government released the *Western Australian Climate Policy – A Plan to position Western Australia for a prosperous and low-carbon future*⁴ (Department of Water and Environmental Regulation 2020). The Western Australian Climate Policy details the State Government's commitment to adapting to climate change and working with all sectors of the economy to achieve net zero emissions by 2050. Within the policy, the 'storing carbon and caring for our landscapes' theme has several actions that relate to forest management, including expanding the conservation estate and areas of the softwood plantation estate. Carbon farming is an emerging area which is likely to develop over the life of this plan.

Forests provide an important source of carbon sequestration. Within Western Australia, forests reduced the State's 2020 net carbon emissions by more than 10 million tonnes (10.7 percent) over that year (CO₂ equivalent) (Department of Industry, Science, Energy and Resources 2022). Managing forests to maintain or enhance carbon storage and improve climate resilience are key components of this plan.

1.3 Enhancing the conservation reserve system

Western Australia has a network of marine and terrestrial reserves (the conservation reserve system), including national parks, conservation parks, nature reserves, State forests and other lands and waters managed under the CALM Act that conserve biodiversity.

The conservation reserve system plays a pivotal role in conserving the State's rich biodiversity, which displays a high level of endemism (plants and animals occurring nowhere else). The conservation reserve system also contributes to:

- protecting and conserving the value of the land to the culture and heritage of Aboriginal people and supporting Aboriginal connection to country through customary activities and joint management
- community wellbeing through provision of ecosystem services
- nature appreciation and recreation opportunities
- research and education opportunities, and
- State and regional economies through nature-based tourism and sustainable resource use and extraction.

The State Government is committed to the development of a comprehensive, adequate and representative (CAR) reserve system, as a fundamental component of biodiversity conservation. Continuing to build on the CAR reserve system will be a key deliverable of this plan.

³ For comparison, the area of CALM Act lands in the planning area is approximately 2.4 million hectares.

⁴ [wa.gov.au/system/files/2020-12/Western_Australian_Climate_Policy.pdf](https://www.wa.gov.au/system/files/2020-12/Western_Australian_Climate_Policy.pdf)

1.4 A new era for forest management

These changes over the last decade have culminated in the opportunity to pursue a new approach to management of the south-west forests. Such an approach prioritises forest health and biodiversity within the 10-year life of this plan to meet both the socio-economic and cultural aspirations of current generations, balancing sustainability of the forests for future generations.

This new approach to forest management in Western Australia for the period 2024-2033 is incorporated within the following strategic goals of this plan:

1. To value and protect Noongar cultural heritage and support Noongar Traditional Owner involvement.
2. To conserve biodiversity and support ecosystem resilience.
3. To maintain or improve forest health and enhance climate resilience.
4. To deliver social, cultural and economic benefits through the provision of goods and services.



Camera checking, Tone State Forest, Manjimup - DBCA

2 Background



Warren National Park - Bron Anderson, DBCA

2.1 Structure

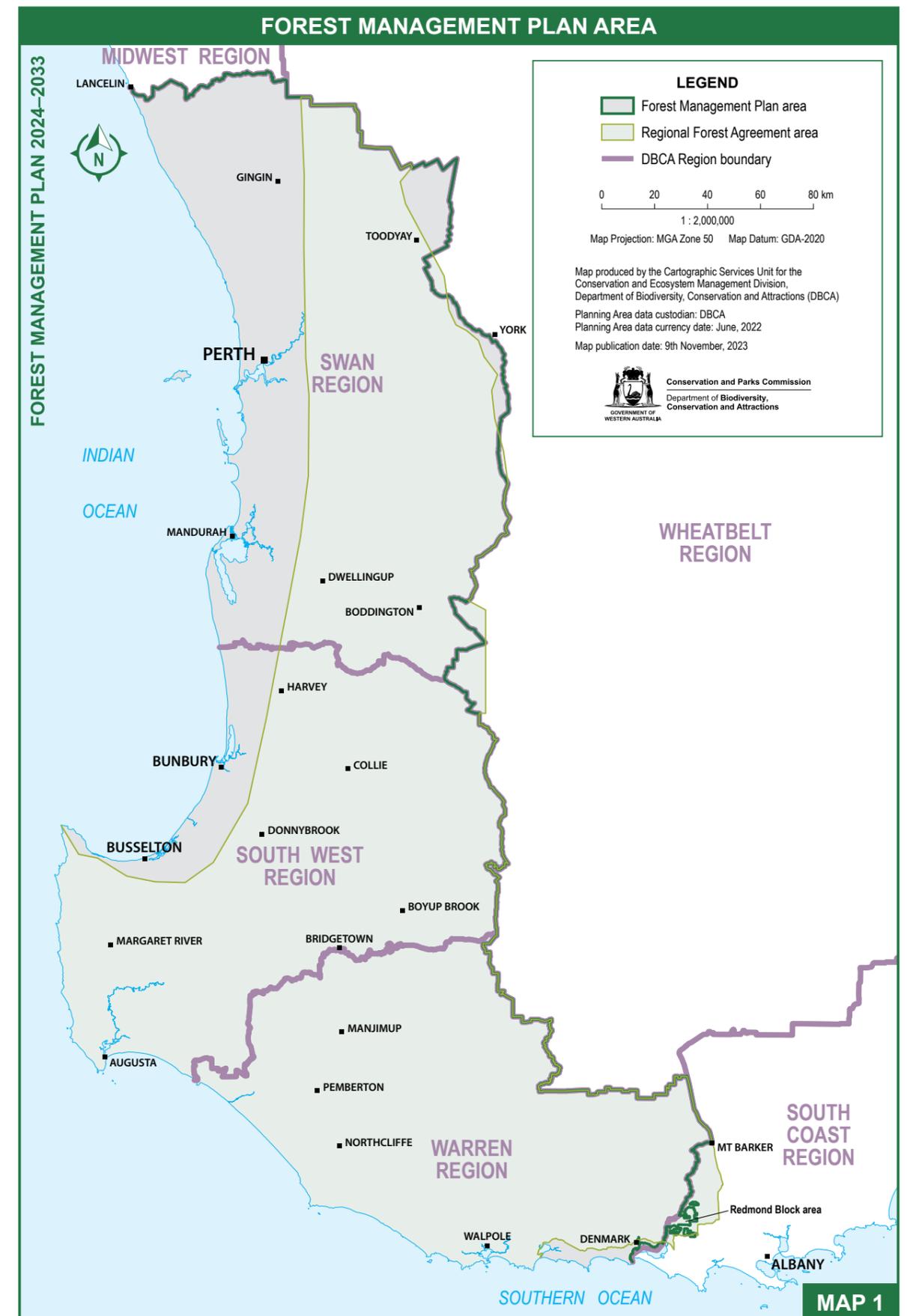
This plan adopts a structure that provides clear linkages between the values and pressures of the south-west forests and the associated management objectives and activities.

The plan is presented in five parts:

- *Directions and Background* – provides an overview of the scope and development of the plan, outlines the frameworks and principles of ecologically sustainable forest management (ESFM) and sets the strategic goals.
- *Part A Valuing our south-west forests* – describes the key natural, cultural, social and economic values and uses of the forests.
- *Part B Pressures on our south-west forests* – describes the major pressures or threats to these key values.
- *Part C Managing our south-west forests* – defines the purpose, term and operation of the plan, and provides the objectives, activities and key performance indicators (KPIs) for the four management ‘foundations’ of this plan.
- *Part D Plan implementation, assessment and adaptive management* – provides an overview of how the plan will be implemented, including an outline of the adaptive management framework and the proposed approaches to monitoring, research, and reporting.

The Background, Part A and Part B are provided as context only and do not constitute a formal part of this plan.

The operative text of the plan, as required by section 55 of the CALM Act, is contained in Parts C and D and relevant associated appendices.



2.2 Scope

This plan applies within the geographic area of the department's Swan, South West and Warren regions (other than marine waters), and the lands collectively referred to as 'Redmond' forest block within the South Coast region (Map 1).

This planning area covers the management of approximately 2.4 million hectares of the following lands vested in the Commission (See Map 2 for areas currently vested in the Commission; Maps 12 and 13 include proposed areas to be vested in the Commission):

- Nature reserves, national parks, conservation parks and other land referred to in section 5(1)(g) and (h) of the CALM Act that has a conservation purpose.
- Indigenous State forest and timber reserves, including State forest classified as a forest conservation area through section 62(1) of the CALM Act.
- State forest and timber reserves planted with exotic species. The application of the plan to these areas is limited to specific proposed management activities labelled for plantations in section 5.6.3.

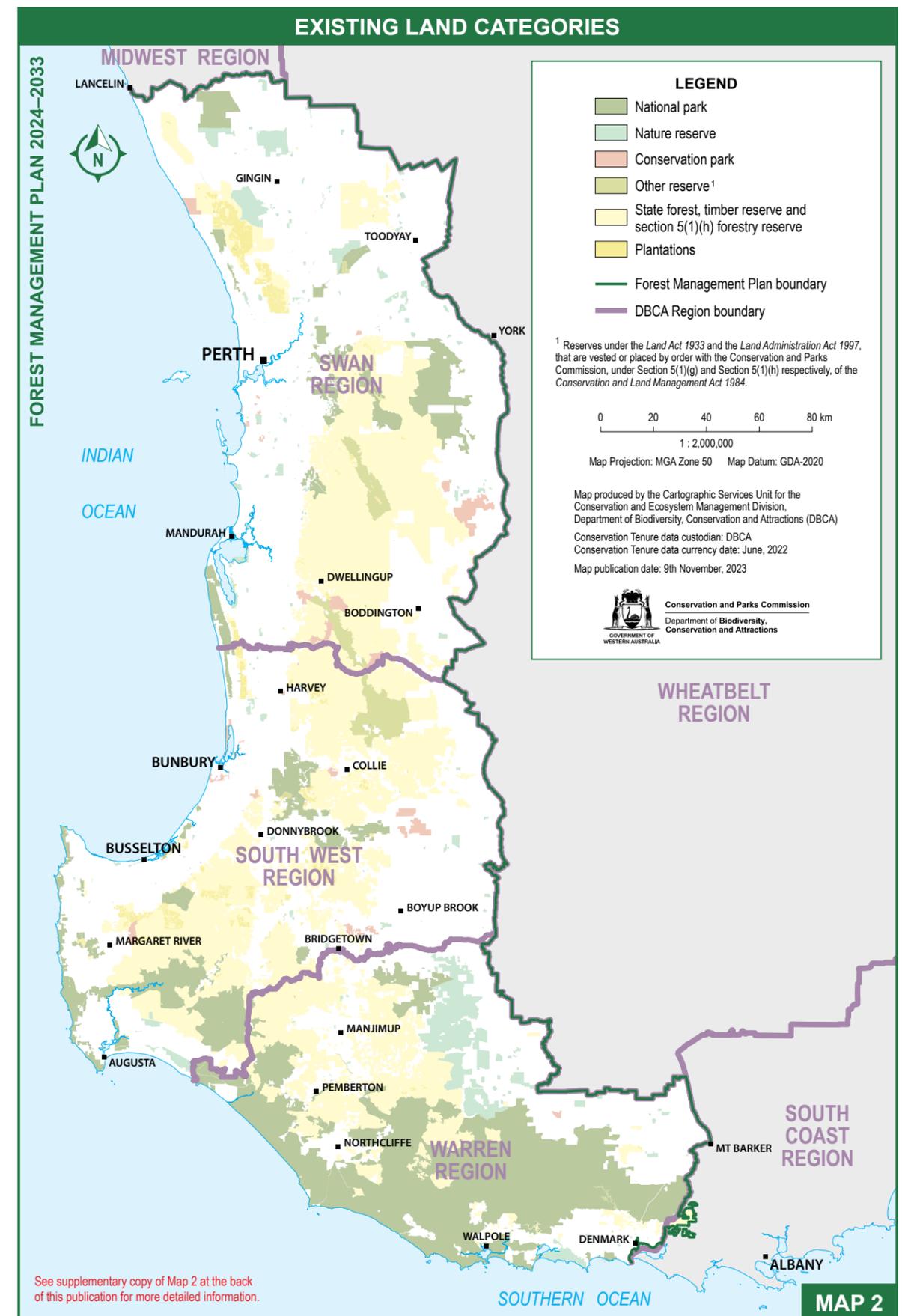
An explanation of the categories and areas of lands vested in the Commission is provided in Appendix 1a.

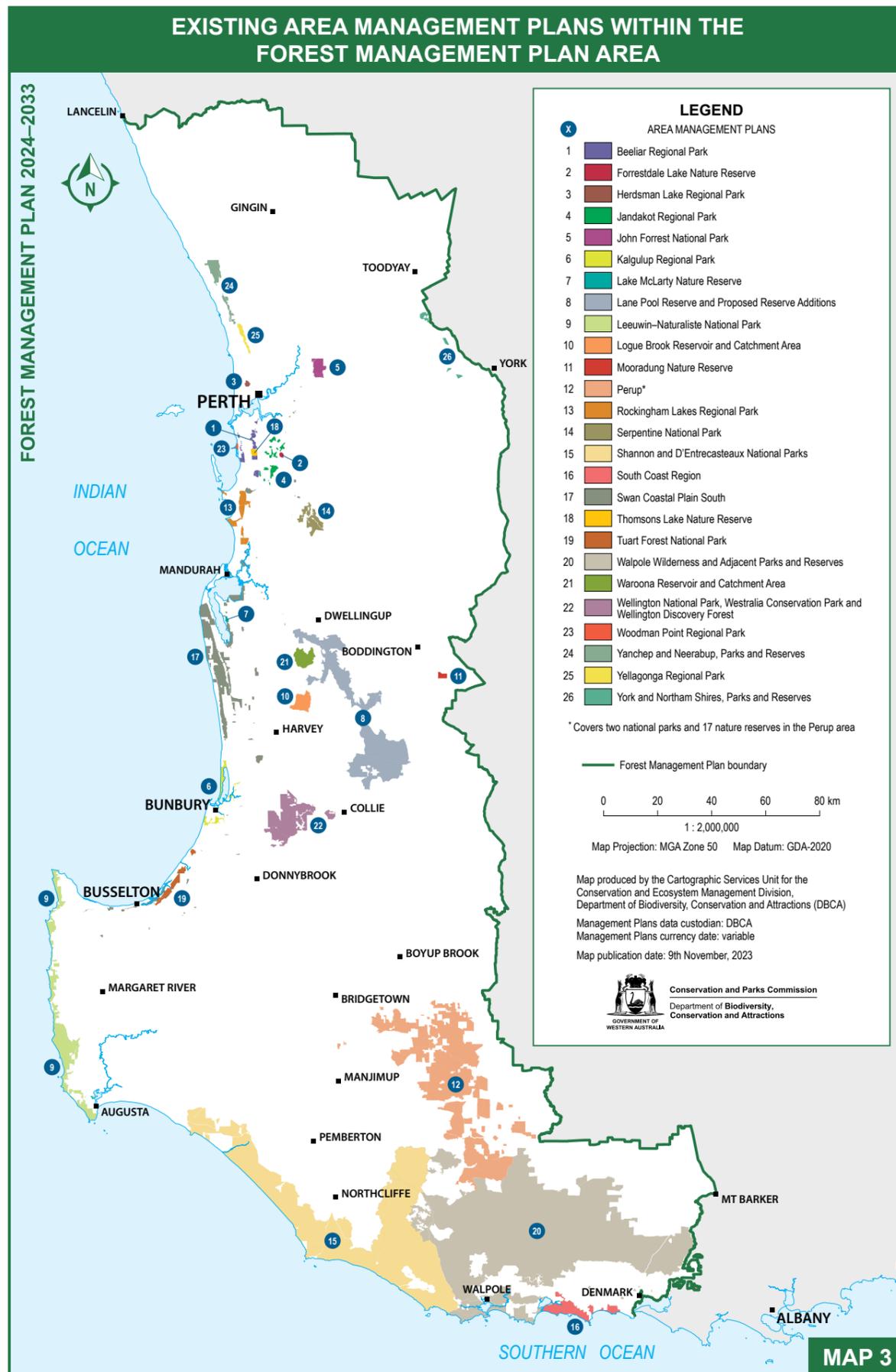
This plan is largely focused on the management of forest ecosystems (categorised as State forest and timber reserves) where a broad range of uses and disturbance activities occur. It also, however, provides for infrastructure and management activities across CALM Act lands in the planning area. On the lands subject to this plan, there are about 2.4 million hectares of native vegetation, of which approximately 80 percent is forest (see Appendix 1b).

The management objectives, activities and monitoring are focused on the forest ecosystems of the planning area, acknowledging that the values, habitats and pressures on the Swan Coastal Plain differ from those of the south-west forests.

This plan will also function as a management plan for conservation reserves where no specific area management plan exists, including those on the Swan Coastal Plain. Existing area management plans (see Map 3) or those developed during the period of this plan which apply to specific parks and reserves have precedence over this plan. Approved management plans are available on the Parks and Wildlife Service website.⁵

⁵ dbca.wa.gov.au/management/plans





2.3 Development of the plan

The Commission has developed this plan through the agency of DBCA, in consultation with the Forest Products Commission (FPC) with regard to State forest and timber reserves, and with the Department of Water and Environmental Regulation (DWER) in respect of public drinking water source areas (PDWSAs). The plan has been prepared following wide-ranging consultation with other agencies, key stakeholders and the public. The plan is also informed by scientific research and investigation carried out by staff from the department, input from technical experts, other published science and management experience, and results from monitoring and evaluation processes.

In mid-2021, the Western Australian Government sought the views of the community on the value and use of the south-west forests through an online survey developed and administered by the Western Australian Biodiversity Science Institute (Subroy *et al.* 2021). As a component of pre-draft consultation for this plan, the department conducted a public survey in early 2022. This was accompanied by a series of key stakeholder focus groups across representative sectors. Additional stakeholder meetings were held with more than 20 individual organisations, including peak bodies, industry organisations, community-based groups and government departments and authorities.

Outcomes of the pre-draft consultation process included acknowledgement that climate change poses a key risk to forest health and resilience; support for increased Noongar involvement in forest and fire management; advocating increased protection of the forests from mining; restoration, conservation and protection of biodiversity; ongoing engagement with the public and stakeholder groups; and measures to assess management effectiveness.

An independent silvicultural review panel assisted in adapting silvicultural guidance and practices to inform the plan (Burrows *et al.* 2022). In addition, the Commission's end-of-term performance review provided directions based on the monitoring and evaluation of FMP 2014-2023 (Conservation and Parks Commission 2022).

The *Draft Forest Management Plan 2024-2033* (Draft FMP) was released for public consultation from October to December 2022, in accordance with section 58 of the CALM Act. Public submissions resulted in modifications to the Draft FMP, as detailed in the report *Summary of public submissions on the Draft Forest Management Plan 2024-2033*.

This plan outlines values of south-west forests consistent with sentiments voiced in the consultation process, seeks to protect these values and conserve biodiversity through a range of complementary management objectives, identifies climate mitigation strategies including carbon sequestration opportunities across the planning area, facilitates Noongar involvement in forest management, incorporates measures associated with assessing and reporting on forest health, and allows for public and stakeholder involvement in forest management activities where possible.

Further information and reports from these consultation and engagement processes are available on the FMP website⁶.

2.4 Approaches to forest management

The forest ecosystems of the south-west have evolved over millions of years, adapting to cycles of climate, fire and human influences. Over the last 200 years the magnitude and rate of change has increased dramatically in some areas due to disturbance from mining, timber harvesting and water abstraction; clearing for townsites, agriculture and infrastructure; the introduction and spread of exotic diseases, weeds and pest animals; and more recently the frequency and intensity of extreme summer bushfire events. Altered weather patterns, attributed to climate change, are creating additional pressures as ecosystems respond to warming and drying conditions that are likely to have both short-term effects (such as localised structural loss) and long-term effects (such as shifts in floristic composition to favour plants more adapted to these conditions).

Section 19(2) of the CALM Act provides for the Commission to consider and advise the Minister for Environment on application of the five principles of ESFM in the management of State forests and timber reserves and forest produce throughout the State. These principles concern sustainability and equity, the precautionary approach, intergenerational equity, conservation of biodiversity and ecological integrity, and economic efficiency when guiding decisions to achieve a balance between the different values and uses of forests.

A suitable framework for planning, implementing, monitoring and reporting on the application of sustainability principles across all tenures is essential for evaluating progress toward sustainable forest management. In 1998 Australia adopted the

⁶ dbca.wa.gov.au/forest-management-plan

framework of criteria and indicators of sustainable forest management known as the *Montreal Process Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests* (Montreal Process; see Appendix 2). Under the Commonwealth *Regional Forest Agreements Act 2002*, Australia reports five-yearly on the Montreal Indicators. Western Australia has contributed to these reports since 1998, the latest being the *State of the Forests Report 2018 Report* (Montreal Process Implementation Group for Australia and National Forest Inventory Steering Committee 2018).

The *Regional Forest Agreement for the South-West Forest Region of Western Australia* (WA RFA) is a 20-year agreement between the Western Australian and Commonwealth Governments on the management and use of the south-west forests. It was first signed in March 1999 and extended for a further 20 years in March 2019. The WA RFA provides a strategic framework for forest management, including consideration of ESFM principles, in combination with the establishment of a CAR reserve system, to ensure the long-term conservation and protection of forest biodiversity, old-growth forest and wilderness values; the management of multiple-use forests outside reserves; and supporting the sustainable development of forest-based industries. The WA RFA region is a subset of the planning area as illustrated on Map 1.

The Montreal Process adopts seven criteria (with 54 indicators) for sustainable forest management: conservation of biological diversity; maintenance of productive capacity of forest ecosystems; maintenance of ecosystem health and vitality; conservation and maintenance of soil and water resources; maintenance of forest contribution to global carbon cycles; maintenance and enhancement of long-term socio-economic benefits to meet the needs of societies; and legal, institutional and economic frameworks for forest conservation and sustainable management.

For this plan, a healthy native forest is one that continues to sustain the natural ecosystem components, including biodiversity and biophysical, ecological and evolutionary processes. Ecosystem components are not static, but interact at varying scales and rates over time. Where forests are subject to disturbance, whether natural or human, their resilience can be described as their capacity to maintain or regain a healthy condition over time.

The forest structures, composition and functions we see today are the outcome of cumulative processes interacting at the patch, stand and landscape scales. Multiple pressures and threatening processes will persist throughout the south-west forests, but appropriate active management can mitigate their impact on forest health, biodiversity values and in some cases restore degraded landscapes. This plan incorporates a range of management activities to be variously undertaken at the patch, stand and landscape scales to manage threats, reduce pressures, and protect intact ecosystems over the next 10 years.

Actions to conserve, protect and restore forest ecosystems, together with targeted management to adapt to the impacts of climate change, will reduce the vulnerability and improve the resilience of forests (Intergovernmental Panel on Climate Change 2022). However, forest ecosystems are complex, dynamic, and their long-term responses to many management activities is uncertain. This is particularly an issue for actions taken to address climate change because our knowledge of ecosystem responses is based on measurements and observations obtained under historic climatic conditions.

When actions are new, exploratory, or their outcomes uncertain, application of an adaptive forest management framework provides a systematic approach to monitoring and learning from the outcomes of management. Adaptive forest management involves appropriate design, monitoring, evaluation and reporting on the outcomes of practices, accompanied by commitment to continuous improvement of practices based on learnings, experience and observations.

This plan will be implemented using an adaptive forest management approach, as detailed in Part D.

2.5 Strategic goals

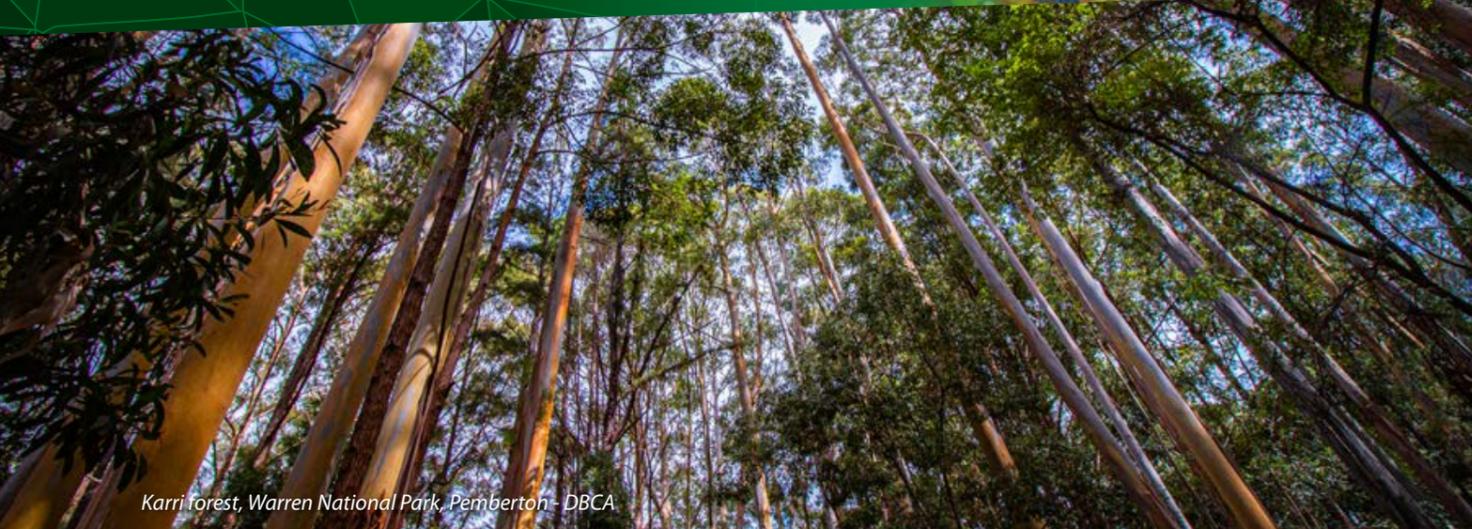
A set of strategic goals has been developed for the planning area that align with legislation, government policy, ESFM principles and the Montreal Process Criteria. The strategic goals are:

1. To value and protect Noongar cultural heritage and support Noongar Traditional Owner involvement.
2. To conserve biodiversity and support ecosystem resilience.
3. To maintain or improve forest health and enhance climate resilience.
4. To deliver social, cultural and economic benefits through the provision of goods and services.

These strategic goals are supported by a number of subsidiary management objectives for which the plan sets out a range of management activities to be undertaken during the 10-year life of the plan (see Part C – Managing our south-west forests).

Hilltop Lookout looking over the Frankland River and the Nornalup Inlet near Walpole - Shem Bisluk, DBCA

3 Part A – Valuing our south-west forests



Karri forest, Warren National Park, Pemberton – DBCA

The Western Australian community places a very high value on the native biodiversity and ecosystems of our south-west forests, as well as the cultural, spiritual, recreational and socio-economic benefits that the forests provide (Subroy *et al.* 2021, DBCA 2022). The values of the south-west forests are those attributes or features that require special consideration in planning and when undertaking management activities.

3.1 Our unique south-west forests

Our unique south-west forest and woodland ecosystems have evolved over millions of years, with their distinctive ecology shaped by varying climates and an ancient landscape. The 2.4 million hectares of native vegetation within the planning area are a subset of the broader Southwest Australian Floristic Region, globally recognised for its rich diversity of plants and animals.

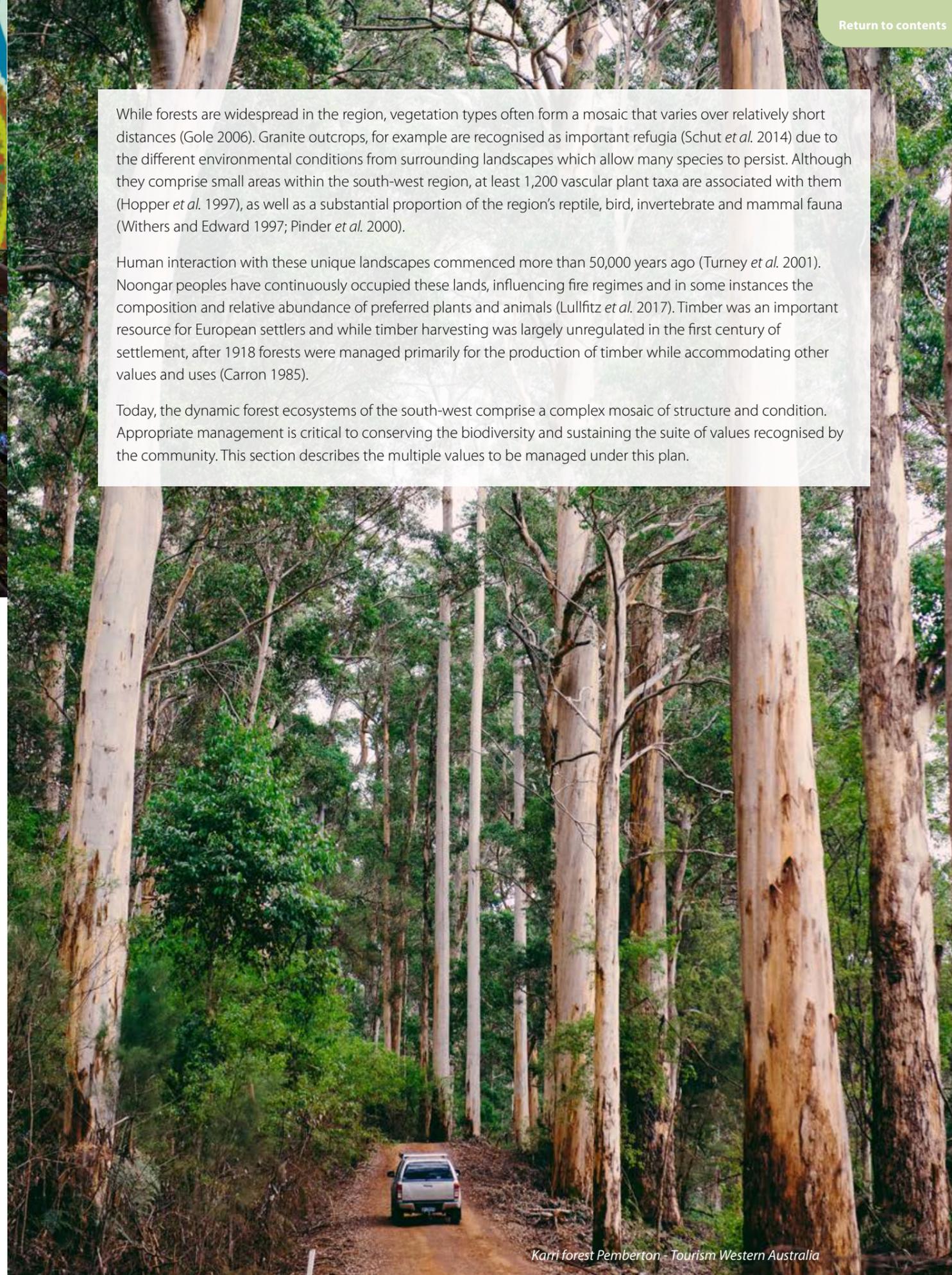
The south-west is also renowned as a hotspot for geographically isolated plants and animals with ancient genetic lineages, such as the Albany pitcher plant (*Cephalotus follicularis*), ngoolboogoor (honey possum - *Tarsipes rostratus*), western swamp tortoise (*Pseudemydura umbrina*), sunset frog (*Spicospina flammocaerulea*) and assassin spiders (Archaeidae) (Hopper 2009). These species survived amid the climatic fluctuations of the Pleistocene era (from about 2.6 million to 10,000 years ago) and increasing aridity that also favoured the expansion of sclerophyllous (hard-leaved) vegetation. This includes the well-known eucalypts, paperbarks, banksias, acacias and grevilleas which are a feature of the forests seen today.

The unique evolutionary history of the south-west forests underpins their biological diversity. Beyond the narrow coastal plains, most of the south-west forest area sits over ancient geological formations that date from more than 1,000 million years ago. Over time, weathering of overlying strata has formed the low, rounded granite (and associated rock types) peaks and slopes that characterise the region. The south-west landscape has been very stable over much of the last 250 million years as the absence of glaciation and volcanic activity, which rejuvenates landscapes, has allowed uninterrupted evolution on weathering landforms. This has resulted in a relatively flat terrain and nutrient-low soils and has supported the emergence of the distinctive characteristics of the region's flora, fauna and fungi.

While forests are widespread in the region, vegetation types often form a mosaic that varies over relatively short distances (Gole 2006). Granite outcrops, for example are recognised as important refugia (Schut *et al.* 2014) due to the different environmental conditions from surrounding landscapes which allow many species to persist. Although they comprise small areas within the south-west region, at least 1,200 vascular plant taxa are associated with them (Hopper *et al.* 1997), as well as a substantial proportion of the region's reptile, bird, invertebrate and mammal fauna (Withers and Edward 1997; Pinder *et al.* 2000).

Human interaction with these unique landscapes commenced more than 50,000 years ago (Turney *et al.* 2001). Noongar peoples have continuously occupied these lands, influencing fire regimes and in some instances the composition and relative abundance of preferred plants and animals (Lullfitz *et al.* 2017). Timber was an important resource for European settlers and while timber harvesting was largely unregulated in the first century of settlement, after 1918 forests were managed primarily for the production of timber while accommodating other values and uses (Carron 1985).

Today, the dynamic forest ecosystems of the south-west comprise a complex mosaic of structure and condition. Appropriate management is critical to conserving the biodiversity and sustaining the suite of values recognised by the community. This section describes the multiple values to be managed under this plan.



Karri forest Pemberton - Tourism Western Australia

3.2 Noongar cultural heritage values

The Noongar people are traditional owners of the south-west region of Western Australia and the planning area (see Map 4). The Noongar Nation is one of the largest Aboriginal cultural blocks in Australia and Noongar people have a profound physical and spiritual connection with their boodjar (land/country). There is also significant diversity among Noongar people, with 14 different language groups (nine of which are covered by the planning area) and three main dialects (see Map 5). Each of these language groups correlates with different geographic areas with ecological distinctions.

The planning area includes about half of the South West Conservation Estate (i.e. approximately 2.46 million hectares), with the FMP footprint primarily over the Whadjuk, Gnaala Karla Booja, Karri Karak (formerly South West Boorah) and the Wagyl Kaip and Southern Noongar Agreement areas. Noongar heritage and boodjar are interconnected. This is explained through lore and customs, creation stories and songs, traditional knowledge of the land and its biodiversity and other cultural practices transferred through generations. Noongar heritage also involves both the archaeological records of Noongar areas of mythological or ceremonial importance, places where traditional and cultural events took place, and the ongoing physical and spiritual involvement of the people with boodjar. Noongar heritage provides an essential emotional, physical and spiritual link to their traditions, culture, practices and identity. It is recognised that heritage places are still used today and provide a means of maintaining Noongar cultural heritage. The protection of Noongar heritage is therefore a matter of maintaining Noongar cultural identity and facilitating access to the land to look after these heritage places and values.

3.2.1 Nyidiny and spiritual connections with the land

Under their traditional lore and customs, Noongar people have responsibilities for looking after country and everything within it. This responsibility was handed down from the Nyidiny or creation times, which means 'cold', 'ice age', 'cold time' or 'ancestral times'. It is the time before time, when spirits rose from the earth and descended from the sky to create the landforms and all living things. Nyidiny stories laid down the lore for social and moral order and established cultural patterns and customs. Noongar spirituality lies in the belief of a cultural landscape and the interconnectedness between the human and spiritual realms.

Everything in the vast landscape has meaning and purpose. Life is a web of inter-relationships where maaman and yok (men and women) and nature are partners, and where koora (past) is always connected to yeyi (present). Noongar Elders have the ability to comprehend the knowledge and to maintain it in an unchanging way. Noongar creation stories can vary from region to region, but they are part of the interconnectedness between all living things.

3.2.2 Traditional knowledge

Noongar kadidjiny (know, thinking, listening, learning, understanding) of boodjar reflects the deep spiritual and physical connection to country and to places of significance. The Noongar people have developed, refined and employed knowledge of the natural environment for tens of thousands of years, and there is a duty to pass on kadidjiny and connection to country to the next generation. This traditional knowledge is also extremely valuable in enhancing contemporary land management practices.

Noongar people have traditionally hunted and gathered food according to their six bonar (seasons): Birak (December and January), the first summer; Bunuru/Boonaroo (February and March), the second summer; Djeran (April and May), cooler weather begins; Makuru/Mookaroo (June and July), the first rains and the coldest season; Djilba (August and September), the second rains; Kambarang (October and November), longer dry periods⁷ (Figure 1). The bonar are based on weather patterns and which plant and animal resources are plentiful during those times. Noongar people have always practised sustainable harvest strategies to ensure the survival of the species they depended on for food, water and medicine.

⁷ noongarculture.org.au

Noongar Seasons

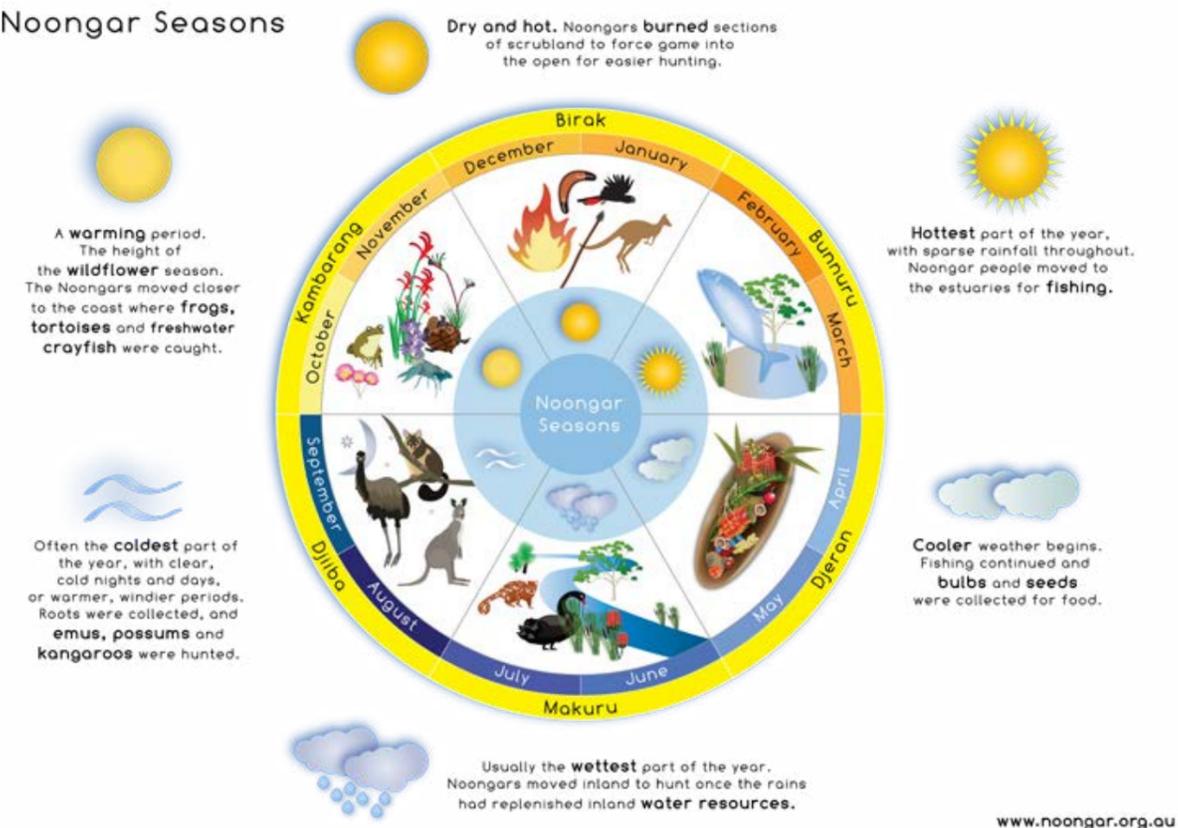


Figure 1. Noongar seasons calendar provided by South West Aboriginal Land and Sea Council (SWALSC)

Noongar Traditional Owners have long used fire for different purposes such as cleaning country, clearing paths, encouraging new vegetation growth, propagating seeds, hunting, cooking, warmth, light, making tools, signalling, ceremonies and for managing the land. Burning with a fire regime appropriate to seasons and forest type reduced the risk of large bushfires, encouraged the growth of bush tucker and medicines, and provided forage for native animals. Forest management provides unique opportunities to link Noongar kadidjiny with contemporary conservation science.

3.2.3 Sites of significance

A large number of Aboriginal cultural sites have been recorded within the planning area. These are places of importance and significance to Noongar people and to the cultural heritage of the State. Aboriginal sites are a diverse range of places including archaeological sites associated with past Noongar land use, and ethnographic and historical sites of ongoing spiritual, historical, and cultural importance and significance to Noongar people.



Mia mia, a traditional Noongar shelter - Photo courtesy SWALSC

For the majority of traditional owners, there is a desire to continue living on country from time to time, learning about and enjoying important areas of the forests and utilising the resources of boodjar. Therefore, the ability to access the planning area for customary practices is considered essential.

As of 30 June 2022, there were almost 900 sites within the planning area on the State's Register of Aboriginal Sites. However, it is highly likely other Aboriginal sites exist that are not recorded on the Register.

Registered sites and their associated values in the planning area include mythological and ceremonial sites connected to Nyidiny, artefact sites, painting and engraving sites, burial sites, fishing and hunting places and water sources.

3.2.4 Enjoyment of country and customary activities

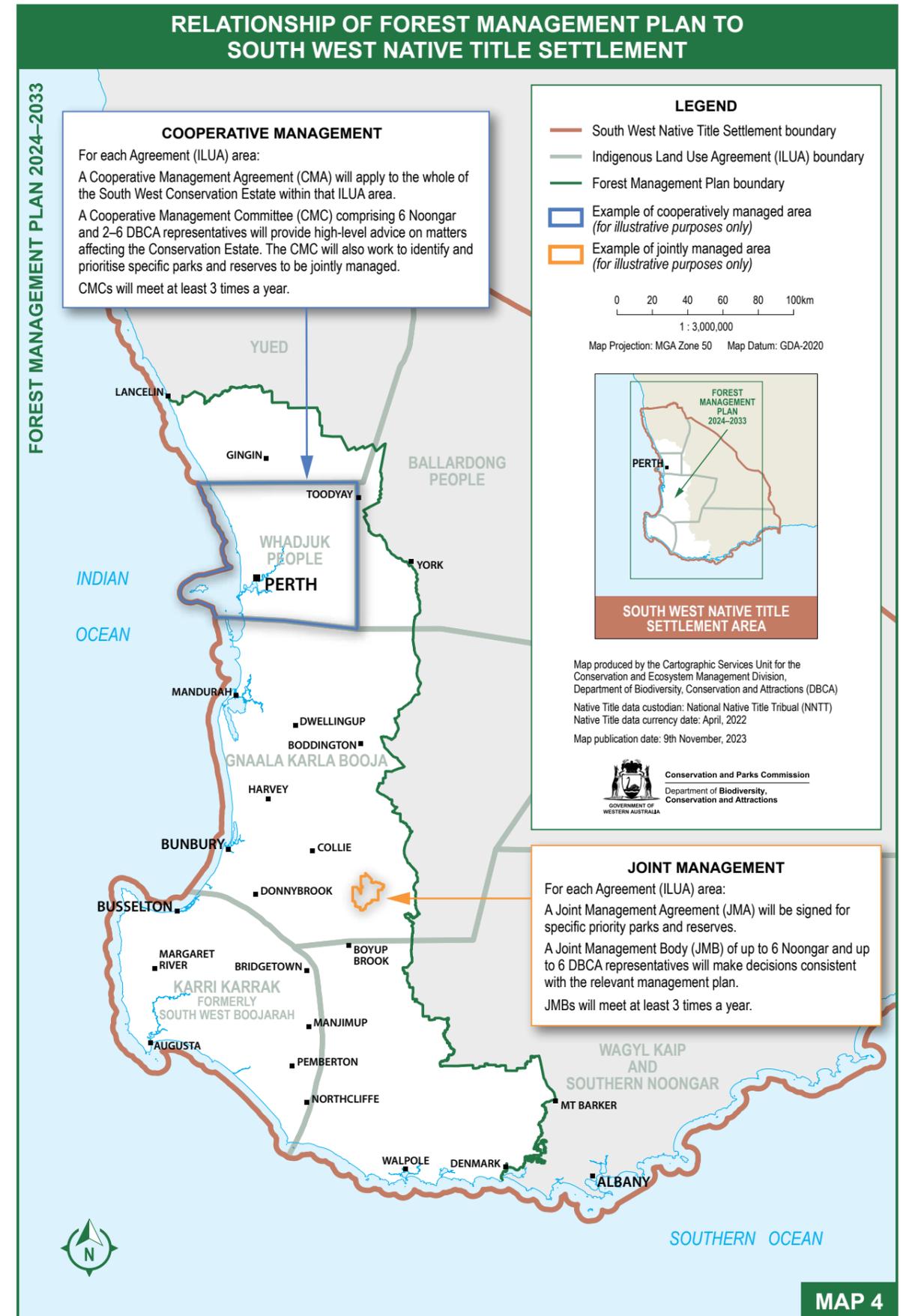
The south-west forests encompass the traditional lands (or 'country') of several different Noongar groups. Some Noongar people who identify with particular areas are descendants of the Noongars who always lived in those places. Others forcibly removed from their homelands have settled and have a strong sense of affiliation to particular areas. For the majority of traditional owners, there is a desire to continue living on country from time to time, learning about and enjoying important areas of the forests and utilising the resources of boodjar. Therefore, the ability to access the planning area for customary practices is considered essential.

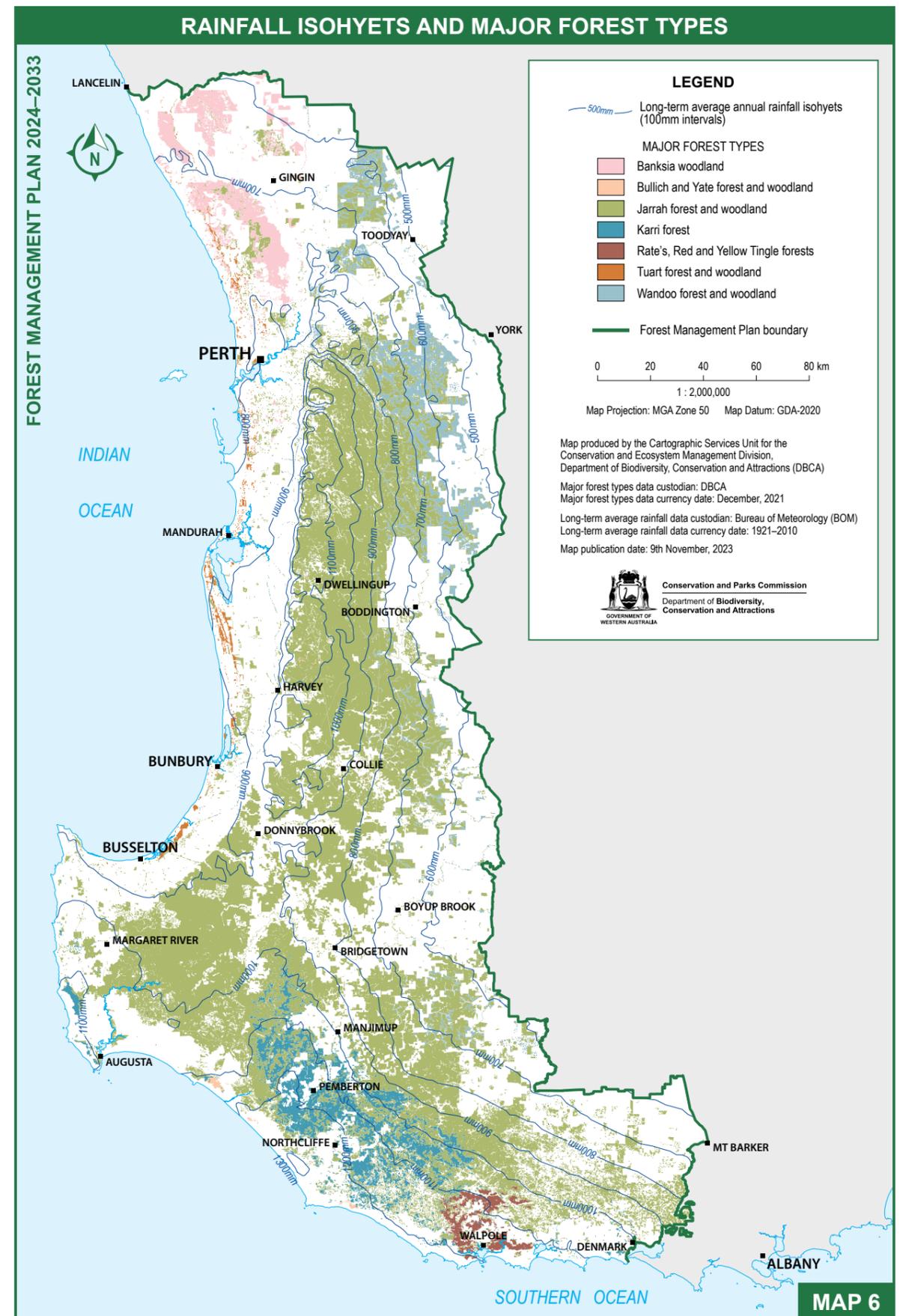
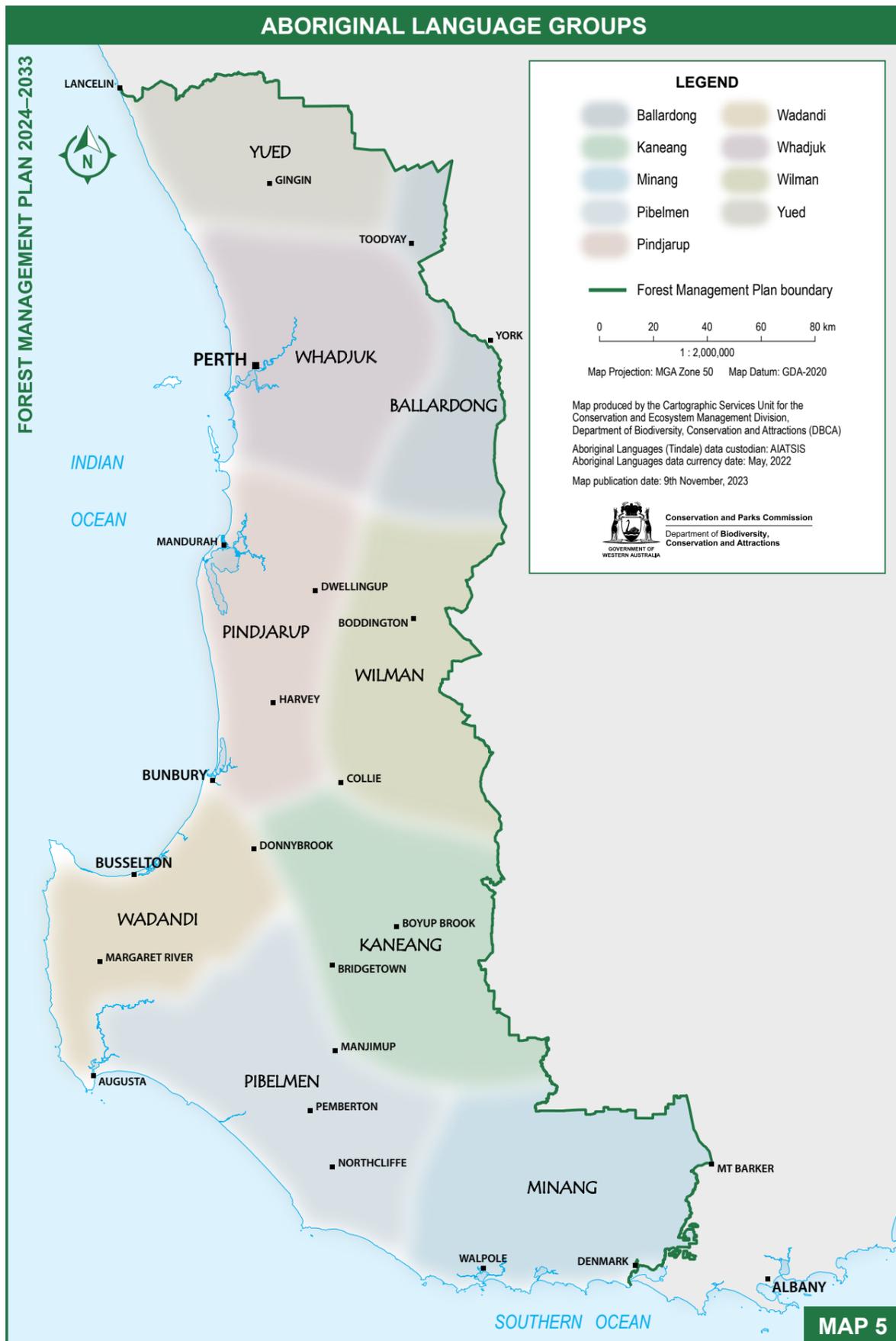
3.3 Physical values

The physical characteristics of the south-west provide important drivers for the unique ecology of our forest ecosystems. The geology, topography and climate are major determinants of the vegetation and fauna communities. Within these broader landscape characteristics, variations of landforms, soils and hydrology provide the conditions for the range of forest ecosystems and the species they support.

3.3.1 Climate

The climate of the south-west region is a typically Mediterranean type, with cool, wet winters and warm, dry summers. Most rain (about 80 percent) falls between May and October and the summer drought can last four to seven months in the northern part of the region (Gentili 1989). Rainfall in the northern part of the forest ranges from 500mm per annum at the eastern edge, to 1,100mm per annum approximately 10km east of the Darling Scarp, reflecting the rain shadow effect of the escarpment. Average rainfall in the southern part of the forest region exceeds 1,300mm per annum at some locations (rainfall data Bureau of Meteorology, see Map 6). The region experiences mean maximum temperatures ranging from about 29°C in summer to around 16°C in winter, and minimum temperatures from 18°C in summer to 7°C in winter. Maximum temperatures can exceed 35°C during the summer, while winter nights may experience frost, occasionally dropping to -5°C.





3.3.2 Geology

The geology of the south-west is dominated by granite and greenstones of the Yilgarn Craton, a large block of ancient crust that has been relatively tectonically stable for much of the last billion years. There are two major geological units that occupy the coastal areas of the region, the Perth Basin to the west and the Albany Fraser Orogen to the south.

The bedrock in the south-west has been unearthed and exposed to weathering since either the Permian glaciation (about 299 million years ago (mya)) or uplift following Early Cretaceous sedimentation (about 145 mya) (Cornelius *et al.* 2008; Cockbain 2014). This has resulted in relatively flat terrain with deeply weathered zones (Cornelius *et al.* 2007). The Western Australian climate has continually changed from humid in the Cretaceous to increasingly arid since the end of the Miocene (about 5.3 mya) (Cockbain 2014). Lateritic soil profiles common in the Yilgarn Craton required several million years of weathering in the Miocene to Pleistocene (about 20 mya to 2.6 mya) under humid temperate to tropical climates and tectonic stability to form (Cockbain 2014). The present-day drier climate of the south-west mainly favours lesser chemical weathering. Ironstones, lateritic duricrusts, and lateritic gravels rich in gibbsite (an aluminium hydroxide mineral) and hematite (an iron oxide mineral) have formed in a period between the Miocene to late Pliocene (about 10 mya to 2.6 mya), at a time when the climate in the south-west Yilgarn Craton was believed to be temperate with warmer temperatures and higher rainfall than present day (Anand and Paine 2002; Cockbain 2014).

The main landforms of the planning area are the Darling and Blackwood plateaux with deeply weathered lateritic soils, and the Swan and Scott River coastal plains with soils dominated by sand and sediment deposited by the ocean or material eroded from the plateaux.

The planning area contains ore bodies with commercially viable minerals. Bauxite deposits are located under the lateritic hardcap in the Darling Plateau; gold is mined near Boddington; lithium at Greenbushes; and coal, east of Collie. The south-west Yilgarn Craton also contains potential for nickel, copper, cobalt and platinum-group elements.

3.3.3 Hydrology

Groundwater

Unconfined aquifers occur within sandy soils of the Scott River and Swan Coastal plains where water tables are generally shallow (3-10m). On the Yilgarn Craton water tables vary in depth from zero to more than 40m. These superficial aquifers tend to occur as localised systems, sitting above the bedrock; within valley infill sediments; and within cracks and fissures within basement geology (Harper *et al.* 2019).

Within the south-west the major aquifers, ordered from shallow to deep are the Superficial, Leederville and Yarragadee aquifers. All three aquifers are used to provide water for industry, horticulture and green space. Garden bores generally access water from the Superficial aquifers, while the Leederville and Yarragadee aquifers are used by the Water Corporation, Bunbury Water Board (Aqwest) and the Busselton Water Board for scheme supply (DWER 2021a).

Saline and hypersaline groundwaters can be found in the east of the planning area, while to the west and the south the salinity of groundwaters is generally lower.

Groundwater levels on the Swan Coastal Plain have been declining due to a combination of water extraction and reduced rainfall. On the Darling and Blackwood plateaux groundwater levels have generally declined since 1975 (Department of Water 2007). The disconnection of groundwater from the stream zone as the climate dries has been associated with sudden and lasting drops in annual streamflow (Kinal and Stoneman 2012).

Wetlands and waterways

Variation in topography, geology, soils and climate have shaped a wide array of aquatic habitats in the planning area including rivers and their riparian zones through to estuarine saltmarshes, clay pans, ephemeral and permanent lakes, damplands, inter-dunal swales, peat wetlands, ngamar on granite outcrops, and subterranean habitats. There are thousands of individual wetlands and more than 6,000km of perennial rivers in the south-west region. The major rivers include the Moore, Swan, Murray, Collie, Blackwood, Donnelly, Warren, Frankland, Shannon, Denmark, Deep, Kent and Hay Rivers. There is also an estimated 41,300km of creeks constituting a significant proportion of the total stream zone length.

Due to seasonal rainfall patterns and streamflow, few natural wetlands have surface water year-round, so seasonal drying is the norm and many wetlands may only retain water for short periods. Along the south coast there are large seasonally filled basins, some with peat deposits and dominated by sedge, rush and shrub communities. In the planning area, five

wetland suites are recognised under the international Ramsar Convention for their internationally significant values, particularly as waterbird habitat. They are Muir-Byenup System, Vasse-Wonnerup System, Peel-Yalgorup System, Becher Point Wetlands and Forrestdale and Thomsons Lakes. A further 39 sites are listed on the Directory of Important Wetlands of Australia.

Aquatic ecosystems in the planning area are important for supporting biodiversity including many threatened and priority species and ecological communities, and migratory birds. Healthy wetlands and waterways are valued for their natural scenic beauty, flora and fauna and recreational pursuits, and waterways in PDWSAs and clearing-controlled catchments provide high-quality water resources. Rivers, streams and wetlands are also important to traditional owners as drinking water and food sources, and have significant cultural value. Dreaming trails often encompass entire rivers and their tributaries, which also provide recreation and camping opportunities.

Wild Rivers are Western Australia's most pristine river systems with the least disturbed catchments. There are six Wild River catchments within the planning area, namely Doggerup Creek, Blackwater Creek, Shannon River, Deep River, Forth River and Inlet River.

3.4 Biodiversity values

Biodiversity means the variability among living organisms and the ecosystems of which those organisms are a part and includes:

- diversity within native species and between native species
- diversity of ecosystems, and
- diversity of other biodiversity components (*Biodiversity Conservation Act 2016* (BC Act)).

Conserving biodiversity requires representation of the full array of habitats and ecological processes at various spatial scales, from entire forested landscapes to localised habitats. It also includes sustaining populations and maintaining their genetic diversity.

While more is generally known about vascular plants and vertebrate animals, these constitute a relatively small proportion of the total species richness in south-west forests. The long-term FORESTCHECK monitoring project found that nearly 80 percent of species biodiversity in the jarrah (*Eucalyptus marginata*) forest were fungi, other cryptogams and invertebrates, with the remainder being vascular plants, and terrestrial vertebrates (birds, frogs, reptiles and mammals) (Robinson *et al.* 2023).

It is noted that Noongar knowledge of plants, animals, ecosystems and seasons has developed over tens of thousands of years and contributes to biodiversity conservation, just as the protection of biodiversity helps conserve and protect Noongar cultural values.

3.4.1 Vegetation and flora

The planning area supports more than 3750 vascular plant species and subspecies – a remarkable richness considering the limited topographic and climatic variation across the region. The number of known species continues to grow with new discoveries and the application of genetic tools to taxonomic research.

The high species richness in the flora of the south-west region is underpinned by high levels of genetic diversity both in species that are widespread across the planning area, and those found only in restricted areas.

As at 1 September 2022, 124 plant taxa in the planning area are listed as threatened under the BC Act, with a further 583 taxa listed as 'Priority' flora (see Appendix 3).

There are 33 threatened ecological communities (TECs) recorded in the planning area, with an additional 68 priority ecological communities (PECs). The TECs and PECs in the planning area are described based on their different types of biota (flora, fauna, macrofungi or microbes) and occur in many types of habitats. Eighteen of the 33 TECs and 10 of the 68 PECs in the planning area are plant-based community types, most occurring on the Swan Coastal Plain.

All of the TECs and 57 (85 percent) of the PECs are endemic to the planning area. There is a total of approximately 21,000 mapped occurrences of TECs and PECs covering a total of 265,000 hectares. Of this total, 243,000 hectares (92 percent)

occur on the Swan Coastal Plain where there is a very high diversity of habitats and vegetation along with high-level pressures from urban and associated development.

3.4.2 Fungi

Forest fungal communities are extremely diverse and play critical roles in the ecology and health of forest ecosystems. It is estimated that there are at least 50,000 species of fungi in Australia, representing about 9 percent of estimated



Fungi *Anthracophyllum archerii* - Richard Robinson

Australian biodiversity (Chapman 2009); most species are yet to be described or even discovered, and this would be the case in the south-west forests. The jarrah forest alone supports at least 670 species of macrofungi (Robinson *et al.* 2023). There are also species that do not produce above-ground fruiting bodies and are therefore not as well known, including mycorrhizal species, pathogens of animal and plants, and species that break down organic matter and thus contribute to soil processes and health. Some fungi are important food resources for animals, such as kwenda whose digging for subterranean fungi has numerous beneficial effects on soil properties, including water infiltration and burying of litter, and helps to distribute mycorrhizal species (Ryan *et al.* 2020; Valentine *et al.* 2018)

3.4.3 Old-growth forest

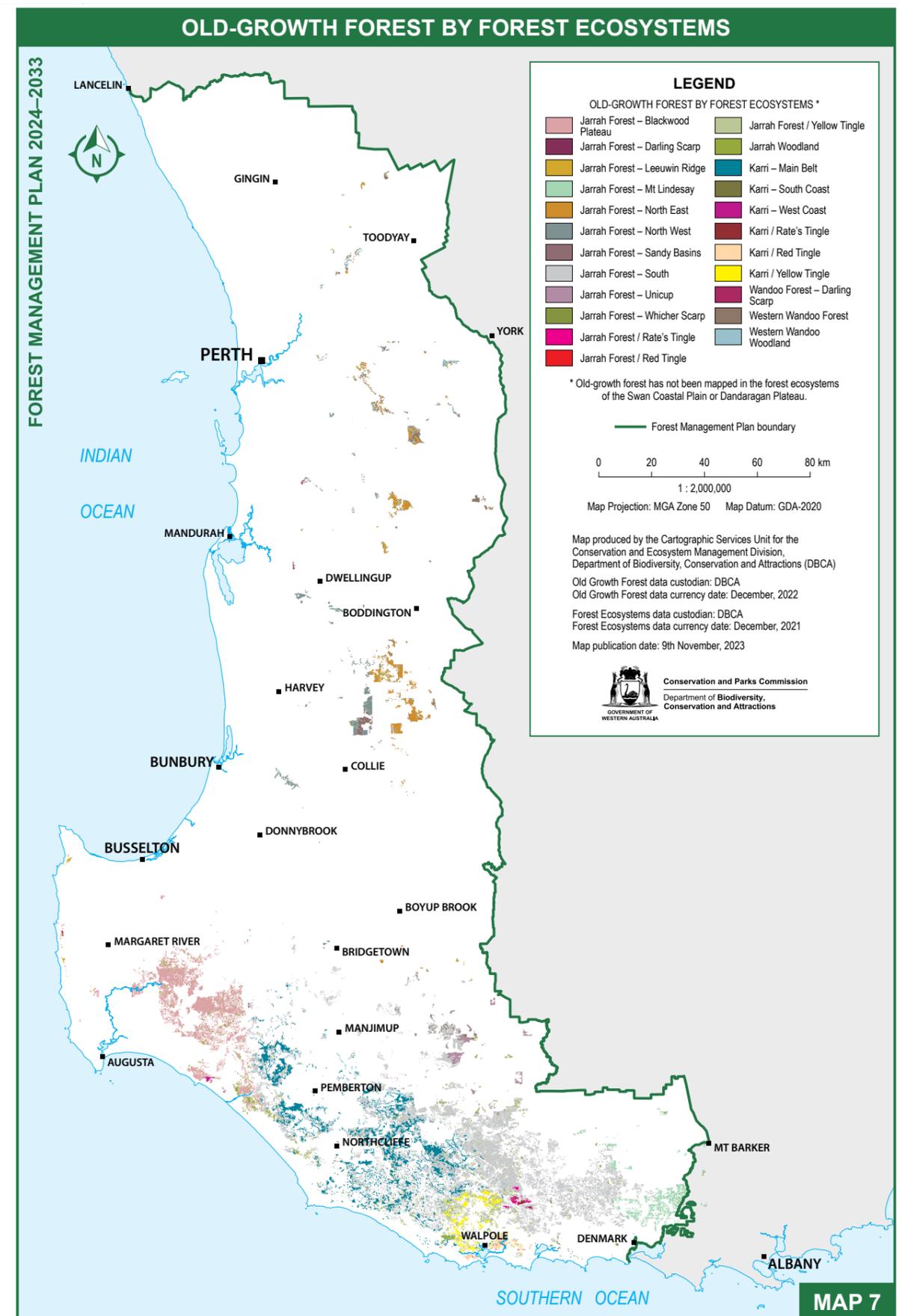
Old-growth forest is defined in the 1992 *National Forest Policy Statement* as “Ecologically mature forest where the effects of unnatural disturbance are now negligible. The definition focuses on forest in which the upper stratum or overstorey is in a late mature to senescent growth stage” (Commonwealth of Australia 1992). Criteria that reflect the different forest types and disturbance histories were developed through the Regional Forest Agreement process and procedures to map the extent of jarrah, karri (*Eucalyptus diversicolor*) and wandoo (*Eucalyptus wandoo*) old-growth forests, and are described



Marri blossom *Corymbia calophylla* - DBCA

in the DBCA *Procedures for the assessment, identification and demarcation of old-growth forest FEM075* (Department of Parks and Wildlife 2017). Essentially, old-growth forests are those that have not been subject to major disturbance by timber harvesting, grazing, mining, or introduced diseases, and that remain dominated by larger, older trees.

Old-growth forests may be representative of the ecosystems and processes evident before arrival of Europeans in the 1820s. Old-growth forests therefore are of special significance to Noongar communities (Regional Forest Agreement Steering Committee 1997; SWALSC 2009) and are a key component of the conservation reserve system. They are highly valued by the community for their biodiversity, connection to nature, aesthetics, and as some of the most carbon-dense areas in the south-west.



Since 2001, all old-growth forests in the south-west on CALM Act lands have been protected from timber harvesting. As at December 2022, a total of 337,620 hectares of old-growth forest has been identified within the plan area, comprising 259,840 hectares of jarrah, 65,440 hectares of karri and 12,340 hectares of wandoo forest and woodland (see Map 7). A further 490 hectares of jarrah old-growth forest has been identified within the Regional Forest Agreement area not covered by this plan.

The size of old-growth forest patches can vary from as small as a few hectares to several thousand hectares. Only small, isolated patches of old-growth forest persist in the northern jarrah and wandoo forests due to extensive timber harvesting, mining, and spread of *Phytophthora* dieback over the last century. In contrast, large expanses of jarrah/tingle and karri/tingle old-growth forests occur in the southern forests, a reflection of the extensive conservation reserves and shorter period that sawmills were operating prior to the cessation of timber harvesting in old-growth forests in 2001.



Tuart forest, Kalgulup Regional Park - Shem Bisluk, DBCA

3.4.4 Fauna

Mammals

Thirty-four species of native mammals are found in the planning area, including nine species of bats. The south-west forests are a refuge for numerous native species that had wider historical ranges across Australia. This is especially so for threatened mammals, including the critically endangered woylie/walyo⁸ (*Bettongia penicillata*), endangered numbat (*Myrmecobius fasciatus*), and vulnerable tjooditj (chuditch – *Dasyurus geoffroyi*). The upper Warren area of the southern jarrah forest is particularly important, supporting the largest remaining and most genetically diverse populations of a number of threatened and priority listed mammals.

The forests are also important for Western Australian endemic species, such as the critically endangered ngwayir (western ringtail possum – *Pseudocheirus occidentalis*), vulnerable quokka (*Setonix brachyurus*), ballawara (brush-tailed phascogale – *Phascogale tapoatafa wambenger*) and kwer (western brush wallaby – *Notamacropus irma*). The forests also support populations of kwenda (quenda - southern brown bandicoot – *Isodon fusciventer*), koomal (common brushtail possum – *Trichosurus vulpecula*), and yongka (western grey kangaroo – *Macropus fuliginosus*).

⁸ Noongar plant and animal names are used throughout the plan where possible.



Tjooditj – Kimberley Page, DBCA

Birds

One hundred and forty-one native terrestrial bird and 113 waterbird species have been recorded in the south-west forests. Thirty-seven bird species are listed as threatened under the BC Act, with a further nine taxa listed as 'Priority' fauna.

The planning area is the stronghold of most of the 13 bird species endemic to the south-west region including the strikingly plumaged red-capped parrot (*Purpureicephalus spurius*), and three threatened black cockatoo species; kaarak (forest red-tailed – *Calyptorhynchus banksii naso*) - vulnerable; ngoolyanak (Baudin's – *Zanda⁹ baudinii*), and ngoolyak (Carnaby's – *Zanda¹⁰ latirostris*) – both endangered.

Frogs and reptiles

There are 89 reptile species and 25 frog species having distributions overlapping the south-west forest region. Of these, 15 reptiles and 11 frogs are restricted to the forest region, or nearly so. There are 10 species of reptiles and four frogs listed under the BC Act occurring in the planning area. Three threatened frogs (white-bellied frog – *Anstisia alba*¹¹ – critically endangered; sunset frog – *Spicospina flammaeaerulea* and orange-bellied frog – *Anstisia vitellina* – both vulnerable) are all restricted to the forest region and have both small distributions and population sizes.

All the forest reptiles and frogs are predators or consumers, largely of ground invertebrates, some with highly specialised diets, and consequently for their long-term survival are dependent on functional forest ecosystems that maintain biological productivity and overall species diversity. Collectively, these attributes make reptiles and frogs important indicators of environmental health.



Kaarak - Doug Coughran

Terrestrial invertebrates

The south-west forest region has a diverse range of terrestrial invertebrates. Total numbers of species are unknown but expected invertebrate richness for the forest area is in the tens of thousands of species (Abbott 1995, Yeates *et al.* 2003,

⁹ Prior to 2023 *Zanda baudinii* were classified as *Calyptorhynchus baudinii*

¹⁰ Prior to 2023 *Zanda latirostris* were classified as *Calyptorhynchus latirostris*

¹¹ Prior to 2022 *Anstisia alba* and *A. vitellina* were classified in the genus *Geocrinia*.

Majer *et al.* 2007). DBCA projects have collected some 4,200 species of macro invertebrates (greater than 10mm in size) from sites in the jarrah forest and adjacent heathland.



Orange-bellied frog (*Anstisia vitellina*) - Christine Taylor, DBCA

The composition of invertebrate communities at sites within the forest changes over relatively small areas (Farr *et al.* 2011). This can be due to the need for a specific host (Moir *et al.* 2011), post fire changes in composition of communities (Brennan *et al.* 2006), and/or variation in temperature and rainfall (Wills and Farr 2017).

Threatened fauna and ecological communities

A total of 190 species are listed as threatened in the planning area. See Appendix 4 for a breakdown of categories of threatened and priority species across fauna types.

In the last 100 years, there has been at least one extinction (the western subspecies of Lewin's Rail - *Lewinia pectoralis clelandi*) and several local extinctions in south-west forests including mammals; boodie (burrowing bettong - *Bettongi lesueur*), and dalgyte (greater bilby - *Macrotis lagotis*); and birds; noisy scrub-bird (*Atrichornis clamosus*), western bristlebird (*Dasyornis longirostris*), western whipbird (*Psophodes nigrogularis*) and western ground parrot (*Pezoporus flaviventris*).

There are five invertebrate TECs that occur in water-filled caves, and one in a very rare mound spring habitat in permanently damp peat. Three TECs and four PECs are microbialites (limestone-like structures formed by microbes in wet habitats).

3.4.5 Forest ecosystems

Forest ecosystems are the combination of species, soils, geology, topography, and climate tied together by physical and biological processes specific to any one site, with trees as the dominant vegetation.

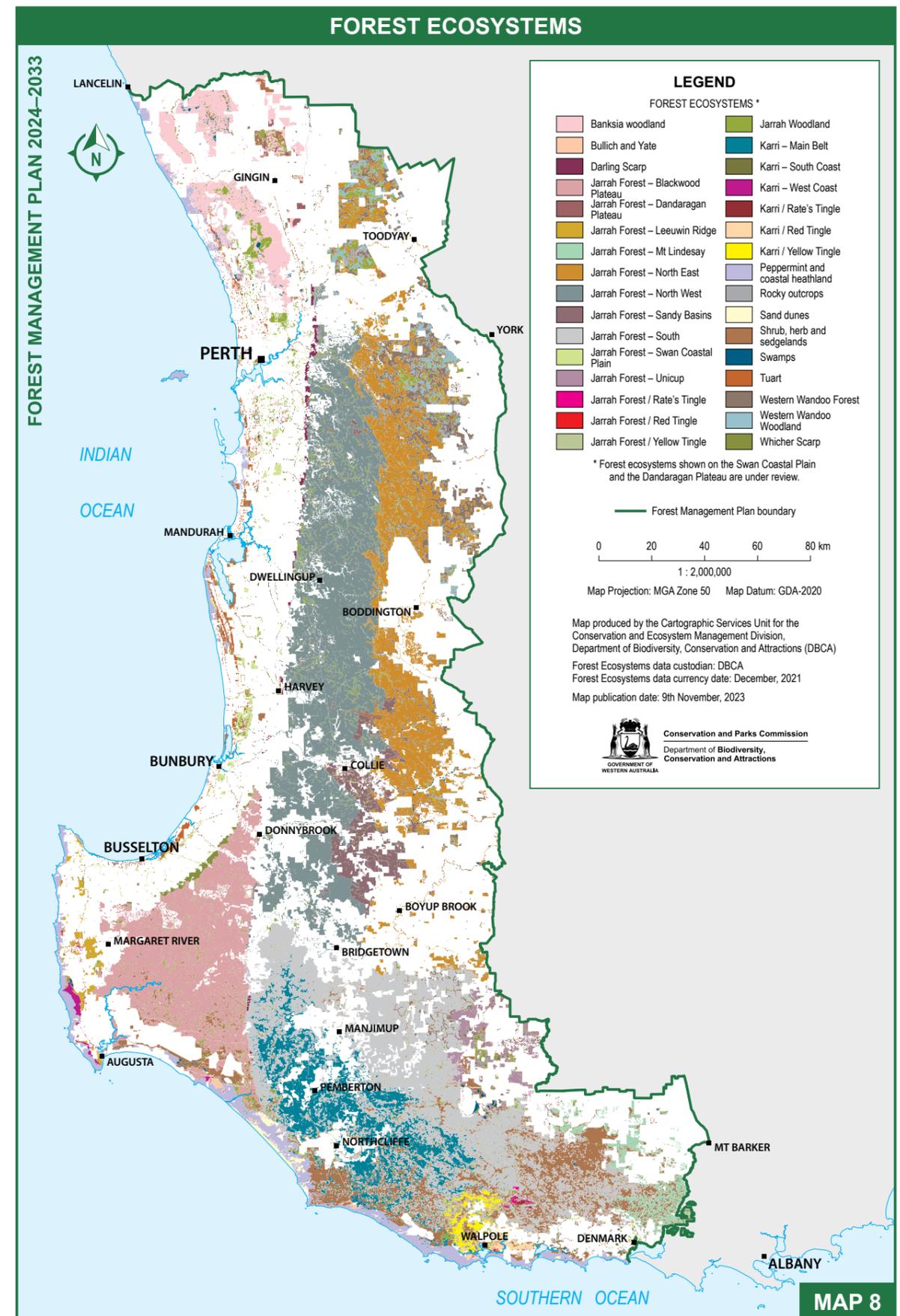
The diversity of ecosystems is reflected in the occurrence of more than 312 vegetation complexes in the forest area (Bradshaw 2015a). Twenty-six broad floristic formations, or 'forest ecosystem types' were identified for the WA RFA as a basis for varying forest management settings and evaluating conservation reserve design (see Map 8).

Jarrah and karri forest ecosystems are the most extensive forest ecosystem types in the planning area (Bradshaw 2015a, 2015b). Jarrah forest ecosystems occur on lateritic soils throughout the northern part of the region and over large areas of the southern part where annual rainfall ranges from 900mm to 1,100mm. The overstorey is dominated by jarrah and marri (*Corymbia calophylla*) with minor occurrences of species such as yarri (*Eucalyptus patens*), bullich (*Eucalyptus megacarpa*) and flooded gum (*Eucalyptus rudis*). Wandoo forest and woodland ecosystems occur in the drier eastern and northern areas (Commonwealth of Australia 1998). Other non-forest ecosystems such as rocky outcrops, sand dunes, shrub, herb and sedgeland and swamps, are interspersed throughout the forest area.

The major ecosystem processes that take place in south-west forest ecosystems include carbon, water and nutrient cycles; and supporting processes such as litter fall and decomposition; hydrological dynamics; fire and post-fire recovery; pollination and seed dispersal; seasonal movements of fauna; soil processes such as aeration, seed burial and water infiltration mediated by digging animals; and the uprooting of trees and other small-scale disturbances.

Forest carbon storage

Carbon in forest ecosystems is stored in the soil (breakdown of plants, animal wastes and microorganisms), in below-ground organic matter (roots, charcoal) and above-ground organic material (trees, understorey plants, leaf litter and fallen trees and branches). Atmospheric carbon dioxide is taken up by plants during photosynthesis (to add to storage)



but is also released back into the atmosphere through plant respiration, decay, and combustion during fires (Montreal Process Implementation Group for Australia and National Forest Inventory Steering Committee 2018).

Increasing levels of carbon dioxide and other greenhouse gases in the atmosphere are a driving factor in global climate change. Globally, forests store a large percentage of the total terrestrial carbon pool, so minimising the loss of carbon stored in forests while maximising the rate of atmospheric carbon sequestered by plants as they grow is essential to mitigate climate change (Intergovernmental Panel on Climate Change 2022).

Current carbon stocks vary between forest ecosystems depending on their natural site productivity and previous harvest and fire history. Estimates compiled for the FMP 2014-2023 suggest the combined above- and below-ground forest carbon stock in 2012 was around 600 million tonnes CO₂-equivalents (Conservation Commission of Western Australia 2013). Applying a similar calculation method but using revised forest stratification, updated timber inventory datasets and refined yield models suggests the total forest carbon stock (excluding soil carbon) in 2020 was likely closer to 1,000 million tonnes CO₂-equivalents. This apparent large increase is due to more comprehensive data and methods, highlighting the importance of improving the relative precision and reliability of estimates of forest carbon stores.

3.4.6 Forest habitats

Forest ecosystems contain a vast array of habitat types for plants, animals, fungi and other cryptogams, and microorganisms. Habitat elements include the forest canopy; tree hollows, branches and trunks; understorey; roots; soils; leaf litter or fallen logs and branches as well as rocky surfaces and mesic areas. Non-forested areas such as rock outcrops and wetlands provide additional habitat features.

Hollows

Hollows in dead and live standing trees are an important and potentially limited habitat resource in south-west forests. Hollows are used for shelter, being particularly important in extreme weather; nocturnal/diurnal resting; protection from predators; and as a safe environment to breed and raise young. The typical minimum tree size for the formation of useable hollows in jarrah and marri is approximately 50cm in diameter at chest height. Large hollows used by cockatoo species are more likely to be found in senescent trees with diameters above 70cm at chest height (Abbott and Whitford 2001).

At least 42 vertebrate species use standing tree hollows including marsupials, bats and birds. The majority of these are highly reliant on suitable hollows for successful breeding (Abbott and Whitford 2001). Hollow logs are also important for ground-dwelling mammal species such as the tjooditj and numbat.

Coarse woody debris

In forest ecosystems fallen trees and branches provide shelter and foraging sites for native mammals, reptiles, invertebrates and frogs. Micro-organisms and fungi are also important in the breakdown of wood and recycling of nutrients back into the soil. Invertebrates can also feed on, or in, wood-decomposing fungi and other cryptogams. One invertebrate group that relies on large fallen trees and branches are velvet worms (Onychophora). These are an ancient group that evolved during the past rainforest climate and require conditions of 100 percent humidity to survive. In summer these conditions are present in the fissures of large fallen tree branches and tree stumps.

Granite outcrops

Granite outcrops are a feature of the south-west forest region and support high species richness. Granite outcrops are often important Noongar heritage sites.

High solar radiation, rapid rainfall runoff and shallow soils combine to allow the formation of microhabitats supporting distinctive ecological communities in these habitats. Some species on granite outcrops are adapted to very dry and extreme temperature and moisture conditions. Others are remnants from an earlier, wetter climate.

Small rain-filled pools on these outcrops, known as ngamar, have formed through weathering of the granite (Timms 2021). The deeper 'pit' ngamar are an important source of water for Noongar people. The shallower 'pan' ngamar and their associated moss beds support distinctive flora (for example, quillworts - Isoetes) and invertebrates, highly adapted to the seasonal presence of water coupled with extreme drying.

3.5 Other Australian heritage values

Since the 1820s, the timber industry has been an important part of establishing European settlements in the south-west. From when the first ships arrived on the coast of south-western Australia in 1826, trees were used as a resource for vessel maintenance, shelter and heating. Timber soon became used for local consumption and export to other Australian states and overseas. The industry was largely responsible for major developments in the south-west, leaving a rich legacy of heritage places (Carron 1985).

In the early years there were many small, makeshift timber operations scattered throughout the south-west with saw-pits producing timber for local consumption. With the emergence of timber companies and export markets, the saw-pits were replaced by steam-driven machines with railways bringing logs to the mills. Settlements around the mills attracted other services such as pubs, churches and shops, to form towns. Many south-west towns, including Jarrahdale and Manjimup, developed as a result of the timber industry and the forestry crews managing the forests. A decline in the timber industry after World War I and the Great Depression saw many mills close, with some now tourism venues (Prause 1991). The Donnelly River mill town is a picturesque, heritage-listed holiday destination and stopover on the Bibbulmun Track and the Munda Biddi Trail. Pemberton townsite was first settled in 1912 and the Pemberton Timber Mill Workers' Cottages Precinct is also listed on the State Register of Heritage Places (Heritage Council 2021).

The timber industry developed rapidly during the 1890s and reached a peak of production in 1913 (Carron 1985). Integral as it was in the development of settlements and the economy, the unsustainable exploitation of native timber, and clearing for agriculture, led to a widespread decline in ecosystem health and biodiversity. In 1894-95, the Government employed a Conservator of the Forests whose duties included designing new forestry regulations, preventing the destruction of young trees, cultivating softwoods and managing the industry generally. The *Forests Act 1918* introduced greater regulation and planning for the use of forests, including the creation of State forests and the Forestry Department.

Following bushfires in the early 20th century, many aspects of rural fire management improved, including organisation of bushfire brigades and extension of the forest fire tower detection and reporting system. Eight lookout trees were established in the south-west between 1937 and 1952. Three of these are popular tourist attractions, being the Diamond, Gloucester and Dave Evans Bicentennial trees.

Throughout the history of the timber industry in the south-west there are ties to the development of settlements, transport and bushfire events that have left behind remnants such as railway stations, old settlement houses, fire lookout towers, sawmills, dams, jetties, and cemeteries. Many of these were constructed using timber from south-west forests.

There is a wide range of places within the planning area that are on local government heritage lists (available on each local government website), the [State Register of Heritage Places](#)¹², the [National Heritage list](#)¹³ and the [Commonwealth Heritage List](#)¹⁴.

3.6 Economic and social values

The south-west forests are important to the economic and social fabric of Western Australia, generating tangible and intangible benefits. Tangible benefits include the provision of jobs and economic outputs for a range of industries, such as tourism and recreation, basic raw materials (BRM), safe drinking water and forest-based produce and resources. Intangible benefits relate to the inherent value of the natural environment and the wellbeing, health, spiritual and quality of life benefits to people from connecting with nature, with increasing numbers of people seeking to live in the towns of the south-west forests for these reasons.

3.6.1 Forest-based produce and resources

Historically the native timber industry has been one of the main forest-based industries in the south-west. Under previous FMPs native timber and forest products have been a major resource use and socio-economic output from State forests and timber reserves. State forests and timber reserves provided for the sustained yield of native timber from

¹² wa.gov.au/government/document-collections/the-state-register-and-other-heritage-listings

¹³ dcceew.gov.au/parks-heritage/heritage/places/national-heritage-list

¹⁴ dcceew.gov.au/parks-heritage/heritage/places/commonwealth-heritage-list

land that may otherwise have been cleared for agriculture (Carron 1985). In the 1970s and 1980s forest management supported a range of values under the multiple-use approach, moving to an ecologically sustainable forest management framework from the 1990s.

The *Djarlma Plan for the Western Australian Forestry Industry (2019-2030)* sets out the strategic directions for that industry and includes the native forests and plantations within the planning area (FPC 2019). Elements of the Djarlma Plan will continue to be implemented by the FPC.

From 2024, large-scale commercial timber harvesting in native State forests will cease. Limited native forest timber, including for craft and high-quality furniture-making industries, will continue to be available from mine clearing and forest management activities, such as ecological thinning for forest health, that will provide direct and indirect socio-economic benefits.

State forest and timber reserves supply other forest produce or material such as firewood, burls, cones, craftwood, seeds, honey and gravel and other material. They also provide access to wildflowers and other native flora desired by the flora industry. Demand for this other forest produce, wildflowers and flora fluctuates considerably. Supply is affected by a range of factors, including seasonal and temporal variability and access constraints.

Mining operations

Existing and substantial mining operations for bauxite, coal, gold, mineral sands, lithium and other minerals occur throughout the planning area. While these operations are not approved under the CALM Act and do not rely on forest management practices to occur, they are subject to other environmental approval processes. The socio-economic value of mining is therefore not included in this plan.

BRM include sand (including silica sand), clay, hard rock, limestone (including metallurgical limestone), gravel and other materials used in construction and road building. These materials may be sourced from State forest and timber reserves for other government agencies and local governments. The department uses these raw materials to support its own management activities, such as road and track construction and maintenance, and development of recreation sites.

Plantations

There are approximately 50,200 hectares of State forests and timber reserves classified as plantation within the planning area. Of this, 32,600 hectares is softwood (pine) plantations managed for sawn timber and engineered wood products which are a critical resource for Western Australia's building and construction industries. Plantations mainly comprise of radiata pine (*Pinus radiata*) and maritime pine (*Pinus pinaster*), but small amounts of other pine species are included.

Softwood and some hardwood plantations established on Crown land are managed in accordance with the CALM Act and the *Forest Products Act 2000* (FP Act) to 'achieve the optimum yield in production consistent with the satisfaction of long-term social and economic needs', which includes meeting supply obligations under State Agreement Acts.

Pine plantations on State forests and timber reserves within the planning area store significant quantities of carbon. Their ongoing contribution to the carbon cycle will vary according to the levels of thinning, clearfelling and replanting undertaken, as well as the in-service life of the wood products generated.

Some plantation areas are also important for water catchment protection, public recreation and provide an important food source for some native fauna (for example ngoolyak). The use of plantations for recreation is generally accommodated, although some limitations on activities exist in water catchment areas and public access may need to be temporarily suspended during harvesting operations or for other reasons.

Wood products are harvested from plantations by the FPC under planning and approval processes established by the department.

Firewood

Firewood is extensively used in homes throughout the planning area, particularly in regional towns as a cost-effective form of heating and cooking, particularly where natural gas is not connected.

Firewood is currently available from commercial firewood suppliers, being sourced through production contracts awarded under the FP Act and managed by the FPC. Firewood is also available in particular locations in the planning area for the public to collect, through the designation of 'public firewood areas', under Part 15 of the Forest Management Regulations 1993 (FM Regulations). There is a long tradition of public firewood being available for collection by residents across the south-west, however neither the demand for, nor quantity of firewood collected from public firewood areas is known.

Apiculture and related products

Apiculture is an expanding industry in Western Australia. The forests of the south-west are an important resource to this industry and honey and beeswax are considered forest produce under the CALM Act. Honeybees (*Apis mellifera*) provide a number of ecosystem services, such as enhanced pollination to increase crop yields, and honeybee products provide valued raw material for food, medicine and cosmetics. There are a number of apiary products with economic value including honey, wax, pollen, propolis, royal jelly, venom, and live export of queens, packaged bees and nucleus hives. The value of Western Australian honey and honey bee products has increased as the State is free of pests and diseases that impact the industry in other parts of Australia and the world.

Commercial apiary sites in the planning area underpin the honey products industry in Western Australia. At the date of publication the planning area represents approximately 25 percent of the State's hives. This access is permitted under strict conditions when suitable species are flowering and producing nectar and/or pollen.

Public drinking water source areas (PDWSAs)

PDWSAs, or water catchment protection areas, provide drinking water to cities and towns from both surface water and groundwater sources. Within the planning area, there are significant areas of PDWSAs that supply water to Western Australia's population. The north-western jarrah forest contains 15 drinking water dams supplying the Integrated Water Supply Scheme, delivering drinking water to 2.5 million people. These dams receive flow from the surrounding forest and are also used to store water from Perth and south-west desalination plants and provide safe drinking water to the majority of the Perth, Peel and south-west regions. Accordingly, management of the land and permitted disturbance activities have important consequences for water quality, supply and public health.

3.6.2 Recreation and tourism

The quality and experience of nature-based recreation is heavily reliant on the perceived beauty and 'naturalness' of the environment in which activities are undertaken. Certain landscape characteristics are accorded with a higher 'value' by the community and provide opportunities for recreation and tourism. They also fulfil a psychological need in providing a contrast to the urban environments in which the majority of Australians live (Western Australian Planning Commission 2007). The planning area contains many areas of perceived high natural beauty and presents ongoing opportunities for considered nature-based recreation and tourism developments.



A log is hauled on rails out of the South West forest by horses, probably near Lyalls Mill - State Library of Western Australia - Image 107037PD

There is a growing demand for outdoor recreation and nature-based tourism. Outdoor recreation contributes to public understanding and appreciation of nature, conservation and forest management, and the social, spiritual, psychological, physical and economic wellbeing of the community. The recreational benefits of Western Australia's parks and reserves include physical and mental health, connection to and increased appreciation of nature and community wellbeing (Aerts *et al.* 2018; Qiu *et al.* 2021).

There is a range of nature-based tourism offerings available in the planning area which provide social, educational and economic benefits including bushwalking, running, cycling, camping, swimming, fishing, canoeing, four-wheel driving, motorcycle riding and caving. There are a number of important tourist attractions in the south-west including the Valley of the Giants and Tree Top Walk, the Bibbulmun Track, the 1,000km Munda Biddi Trail, and Calgardup, Giants and Mammoth Caves. Many national parks in the region also provide for outdoor recreation and nature-based tourism such as Wellington, Beelu, Warren, Leeuwin-Naturaliste, Walpole-Nornalup, Gloucester and Greater Beedelup. A growing number of regional towns and locations are an important element of various trail networks.

Camping is a very popular activity that draws people to the region, and campers are an important part of many local and regional economies. The most popular camping destinations in the south-west are Lane Poole Reserve, and Leeuwin-Naturaliste and Wellington national parks.

Tourism and recreation in the planning area includes both facilities and experiences provided by the department, such as trails and camping areas, as well as by the private sector, where authorised, such as licensed tour operators or accommodation provided under leases. In this way, the department partners with the private sector to broaden the range of facilities and experiences available for people to visit and appreciate the planning area, in a way that contributes to regional economies through local businesses. The role of the south-west forests as a destination for recreation, tourism and outdoor education is expected to remain high given the popularity of nature-based activities, and development of new adventure-based visitor experiences such as Lake Kepwari near Collie, Collie Adventure Trails, and Dwellingup Adventure Trails.

Forests and reserves close to Perth are important for public recreation due to their proximity to a large percentage of the State's population. These areas provide an escape from urban living and an opportunity for outdoor activities such as hiking, camping, cycling, and spending time in nature. Being located near a major city also makes these forests and reserves easily accessible to a wide range of people, allowing for increased participation in outdoor recreation and promoting a connection to nature. This proximity to nature helps to improve the physical and mental health of those who visit, and the conservation and protection of these areas is important for maintaining their value to the community as recreational spaces.

Annual visitation to DBCA-managed recreation sites in the planning area in the 2020-21 financial year totalled 12.65 million, which is 40 percent higher than the visitation of 9.05 million in the 2012-13 financial year when the last FMP was published. There were approximately 900,000 more visitors to the planning area in 2020-2021 than in 2018-2019, possibly a result of international travel restrictions in place at that time due to Covid-19. The greatest visitor numbers were recorded in Swan and South West regions. The average visitor satisfaction level increased to 92.3 percent in 2020-21, compared to 88 percent in 2012-13.

Dave Evans: Bicentennial Tree, Warren National Park - Tourism Western Australia

Vehicle driving and riding of motorcycles continue to be popular recreational activities in the planning area. The demand for sanctioned or organised trails and driving/riding areas is currently largely unmet with limited provision for trails and other facilities for 'off-road' driving or riding activities. Off-road activities (i.e. operating vehicles off sanctioned vehicular roads and tracks), particularly using unlicensed motorcycles and other off-road vehicles, is regularly reported as an unauthorised activity in parks and reserves (see 4.7 Unauthorised activities).

Permitted areas for off-road registered vehicles including motorcycles on department-managed lands currently exist in former pine plantation areas at Gnangara and Pinjar. Designated trails specific to road-registered vehicles and motorcycles include the Captain Fawcett Track. Further areas may need to be identified to meet the demand for recreational and tourism-related activities using these vehicles and to counter unauthorised use, with a variety of options (both on and outside CALM Act lands) requiring consideration.

Events provide an opportunity for visitors to explore parks in a different and varied way. They range from small, local club events to major international events, and include competitive and non-competitive (participation) events, adventure racing and cultural immersion events. The department issues lawful authorities or licences for organised events on land which it manages, including trail running, mountain biking, horse riding, adventure racing, opera and other arts events and rallies.

3.6.3 Amenity and aesthetic value

The natural landscapes in the planning area are valuable for their intrinsic qualities, for the quality of life and enjoyment of people, and for the economic benefits they generate. Identifying and protecting the visual amenity of natural areas ensures those values are protected and maintained for the social, spiritual, cultural, and economic benefit of the community. Visual landscape management guides the planning and implementation of activities that may impact the visual quality of a landscape, ensuring uses and activities complement, rather than detract from, the inherent visual qualities of the landscape.

Visually significant landscape elements include undulating and steeply sloping landforms, well-defined and deeply incised valleys, flat plains, permanent rivers and standing pools, expansive forest with minimal disturbance, and granite domes and outcrops.

These landscape elements are features of numerous reserves in the planning area including Lane Poole Reserve, Tuart Forest National Park, Boranup Forest in Leeuwin-Naturaliste National Park, Walpole Wilderness Area, Blackwood State Forest and Wellington National Park.

3.6.4 Land use planning

Amendments to tenure may be required to meet land use planning commitments, for the provision of services, or to rationalise and upgrade road networks. These amendments are typically in the form of an excision from State forest or timber reserves, and occur under provisions in the CALM Act.

Where an excision from State forest or timber reserve is required to enable alternative land uses, an amendment will also be required to the relevant region scheme and/or local planning scheme in accordance with the *Planning and Development Act 2005*.

Lane Poole Reserve, Dwellingup - DBCA

4 Part B – Pressures on our south-west forests



Walpole treetop - DBCA

Our south-west forests and the biodiversity they support are under increasing pressure from threats such as climate change, habitat loss and fragmentation, weeds and pest animals, altered hydrological regimes and inappropriate fire regimes.

Maintaining ecosystem health and resilience is important for sustaining the various values and uses of natural areas, including biodiversity and Noongar cultural heritage values.

Understanding the nature of disturbances and their effects on ecosystem health and resilience is important. An ecosystem's responses to disturbances can vary over space and time due to:

- the type of disturbance; whether abiotic (such as bushfires, frosts, storms and climate change), biotic (such as weeds, pests and disease-causing pathogens) or human induced (such as timber harvesting and vegetation clearing for mining and other developments)
- the characteristics of the disturbance, which includes timing, intensity, frequency, and scale
- interactions with other pressures and drivers of change, whose effects can be cumulative or synergistic, and
- characteristics of the species, populations, and communities involved.

The capacity of ecosystems to recover from disturbances is dependent on the rate (faster change is more challenging) and extent of change. Ecosystems and species have evolved over time and have some level of flexibility and adaptability. Disturbance can have a fundamental role in regenerating and maintaining biodiversity. The ephemeral plant species that germinate after fire are an example of the so called 'pioneer' species that do best after disturbance.

Most of the forest ecosystems as we see them today have been affected to varying degrees by human activities, in particular by actions or practices introduced since colonisation by Europeans commenced in 1826. By 2022 approximately 337,000 hectares or 8 percent of the estimated 3.97 million hectares of jarrah, karri and wandoo forests present in 1826 remain as old-growth forest in a largely unaltered condition.

The structure and condition of the forest overstorey has been markedly altered across different eras of timber extraction and mining operations. Timber harvesting was initially uncontrolled in the 1800s, then from 1918, occurred with silvicultural management to ensure the regeneration of trees. Most jarrah and wandoo forests north of Bridgetown have been selectively cutover for jarrah sawlogs at least once, while extensive areas north of Collie have been cutover up to four times. These cutover jarrah and wandoo forests now comprise a higher proportion of regrowth stems, with nearly 169,000 hectares of cutover jarrah silviculturally treated during the 1930s depression to encourage tree growth. Harvesting in karri forests commenced much later than in jarrah forests and included management practices such as clearfelling. Consequently, past practices have led to changes in the structural composition of previously harvested jarrah and karri forest.

The present-day distribution and abundance of native fauna within the forests has been significantly influenced by introduced predators, particularly the European fox (*Vulpes vulpes*) since the 1930s and feral cats (*Felis catus*). Similarly, the introduction of the plant pathogen *Phytophthora cinnamomi* (*Phytophthora dieback*) has had major impacts on the floristic composition and abundance of plant species, with almost 15 percent of south-west forests now mapped as infested.

Changes in fire regime (seasonality, frequency and intensity) also have an ongoing influence on vegetation and habitat condition, including the regeneration of key plant species.

Since at least the 1970s, climate change has created a shift to drier and warmer conditions across the region, leading to reduced streamflow and runoff. Other disturbances may cause long-lasting changes (for example, persistent drought) that may not become fully evident for some time, and which are difficult, if not impossible, to reverse.

The community regards managing pests and feral animals, managing diseases, and protecting threatened species and communities as important management priorities to respond to known pressures (DBCA 2022). This section covers these pressures along with threats associated with climate change, weeds, fire and vegetation clearing.

4.1 Climate change

The sixth report of the Intergovernmental Panel on Climate Change (IPCC) was released in early 2022 and highlights an urgent need for global action to reduce greenhouse gas emissions to limit the impacts of global warming (IPCC 2021). The IPCC notes the south-west forests as an Australian ecosystem at risk due to climate change. Changes to the climate of the south-west region have already been observed, and with future projections from all global climate models forecasting further warming and drying, climate change will be a persistent, escalating stressor on all ecosystems in the planning area.

4.1.1 Observed and predicted climate for the south-west

The climate of the south-west has experienced substantial natural variability in rainfall over the last seven centuries (O'Donnell *et al.* 2021). The last 50 years, however, has seen a consistent trend toward reducing annual rainfall (see Map 9) and increasing average temperatures across the planning area. Accompanying the reduction in total rainfall have been shifts in rainfall seasonality, with a 20 percent decline in May to July rainfall in the region since 1970 (relative to the 1900-1969 average). The reduction for May to July rainfall has been greater in the last two decades at around 28 percent since 2000 (Bureau of Meteorology (BOM) and CSIRO 2020). Mean temperatures have increased in the region by about 1.1°C since 1910, with the rate of warming higher since 1960 (DWER 2021b). Summer heatwaves and prolonged drought periods have also been more frequent in recent decades.

The south-west is predicted to experience continued drying and warming trends over the coming decades (Andrys *et al.* 2017; DWER 2021b).

Map 9 depicts the trend in rainfall from 1970 to 2020. It illustrates a decrease of up to 40mm per decade in total rainfall in parts of the region.

The rate and magnitude of projected changes in rainfall, temperature and evaporation vary between different climate models and assumptions about future emissions and mitigation outcomes. However, there is agreement on the overall trends and patterns, including the projections on rainfall and temperature summarised in Table 1.

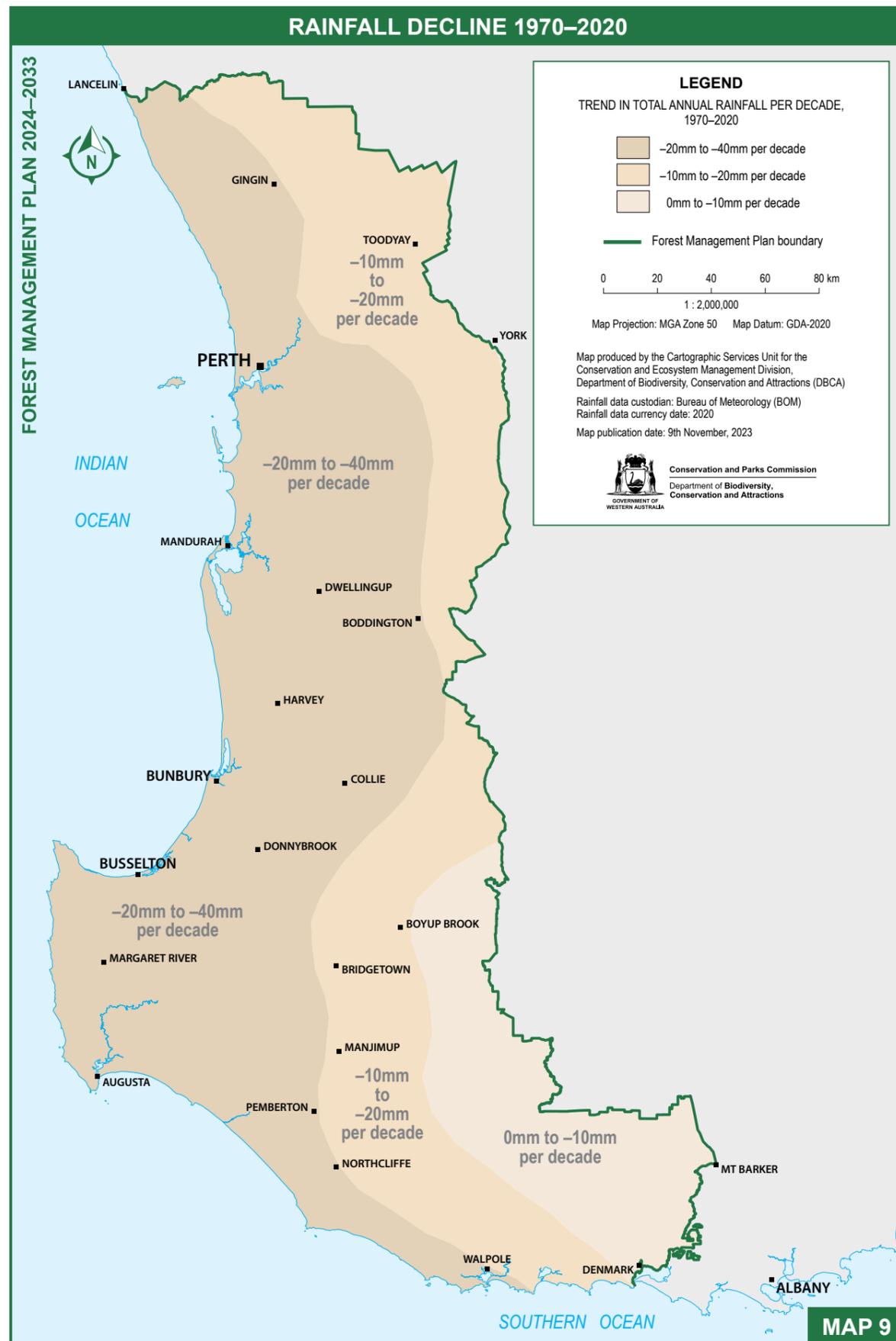


Table 1: Projected climate changes in south-west Western Australia

Rainfall	Temperature
Winter rainfall is projected to reduce by up to 15 percent by 2030 relative to the 1981-2005 period under all emissions scenarios (DWER 2021b).	Higher mean, maximum and minimum temperatures are expected (Hope <i>et al.</i> 2015).
By 2090 the winter rainfall reduction could be up to 25 to 45 percent relative to the 1981-2005 period depending on assumed emission scenarios (DWER 2021b).	By 2030 the mean annual warming across all emissions scenarios is projected to be about 0.5 to 1.1°C above the average climate of 1986-2005 (DWER 2021b).
Rainfall declines are forecast to vary across the region, with the north-east of the planning area likely to experience the largest proportional decline (Andrys <i>et al.</i> 2017). This is consistent with the pattern of rainfall and vegetation canopy declines recorded to date (Conservation and Parks Commission 2022).	The temperature and frequency of very hot days are expected to increase, and heatwaves will get longer and more intense (DWER 2021b).
The duration and severity of droughts are predicted to increase (Hope <i>et al.</i> 2015), along with potentially large fluctuations in the number and intensity of summer rainfall events (Andrys <i>et al.</i> 2017).	There are likely to be fewer frost events across the region (Hope <i>et al.</i> 2015), but they may increase at a local scale (Matusick <i>et al.</i> 2014, 2016).

4.1.2 Potential consequences of climate change

Climate change presents significant challenges for maintaining forest health. An increase in moisture stress is expected across the south-west due to future drying and warming conditions, shifts in seasonality of rainfall, and increased risk of extreme weather events. The resilience of forests will vary depending on site characteristics such as soil type and depth, elevation, and aspect, as well as the structure and density of vegetation.

The progressively drier and warmer conditions will interact with existing stressors operating within these landscapes, such as fire, disease, weeds or pest animals, with potentially additive or synergistic effects. Where climate-related extreme weather events occur such as heatwaves, higher bushfire intensities, or storms, they may amplify the impact of other pressures on native species.

The exact consequences of changing climate on the natural ecosystems of the south-west are difficult to predict due to the:

- inherent uncertainty of climate projections
- complex interactions between ecosystem components, including feedback processes, and their interactions with other pressures, and
- incomplete knowledge of the 'normal' range of functioning and tolerance of ecosystem processes to altered temperature, rainfall and seasonal variability.

While changes are expected to put significant pressure on a broad range of organisms, understanding the responses to climate change and the underlying mechanisms to inform mitigation actions will remain a priority over the life of the plan, as recommended in the end-of-term review of performance of the FMP 2014-2023 (Conservation and Parks Commission 2022).

A summary of research findings related to potential climate change consequences as they apply in the planning area is provided in Table 2.

Table 2: Potential consequences of climate change for the south-west forests

Summary of research findings

Hydrology

The level of moisture stress varies across seasons and depends on such factors as rainfall, soil depth and water-holding capacity, vegetation composition and density. Surface and groundwater-dependent ecosystems such as wetlands are highly vulnerable to hydrological changes, including TECs and PECs. Vegetation associated with shallow groundwater, streams and riverine areas will also be at risk of drying and contracting, with significant implications for aquatic fauna and threatened species such as the sunset frog.

- Declining rainfall has been closely linked to declining streamflows and increasing depth to groundwater in northern jarrah forest catchments (Silberstein *et al.* 2012; Raiter 2017; Harper *et al.* 2019).
- In some catchments there is evidence of groundwater disconnecting from the valley floors, with streams then ceasing to flow (Kinal and Stoneman 2012).
- Observed changes have been attributed to a combination of drying climate and an increasing proportion of young, dense regrowth forests in the landscapes (Silberstein *et al.* 2011; Macfarlane *et al.* 2010).
- Reduced surface run-off and increasing depth to groundwater has also been recorded in southern jarrah and karri catchments, albeit at lesser levels in higher rainfall areas (Hughes 2021).
- Further declines in rainfall, runoff and aquifer storage are projected to continue under forecast drying conditions (Silberstein *et al.* 2012; McFarlane *et al.* 2020; Hughes and Wang 2022).
- Declining water quality in wetlands and waterways due to reduced rainfall, surface water flow (less flushing) and groundwater inputs and increased bushfires (Kauhanen *et al.* 2011).
- Drying of peat-based wetlands causing exposure of acid sulfate soils, leading to acidification (Partridge and Finlayson 2022).

Vegetation and flora

Ecological responses to date range from landscape scale changes, demographic shifts within vegetation communities, to individual plant mortality and die-off events and timing of reproductive cycles. Whether forest patches remain healthy or adjust to warmer and drier conditions via shedding of leaves, or plant mortality, will depend on a species' ability to manage moisture stress (and biotic co-factors such as pests), the magnitude of drought/heat events, and the level of competition at a site.

- Studies have documented declines in net primary productivity and vegetation cover in the northern forests and woodlands (Brouwers and Coops 2016; Wallace *et al.* 2009).
- There have been vegetation community shifts away from species that prefer seasonally moist soils (Mattiske Consulting 2012).
- As rainfall declines along the eastern boundary of the planning area, shifts in forest cover and species distribution are likely, including transition from forest to more open woodland structure (Yates *et al.* 2010a, 2010b; Maher *et al.* 2010).
- Modelling of climate change impacts on key plant species and fauna habitat has predicted range contractions and shifts towards higher rainfall areas (Molloy *et al.* 2014).
- Areas of the northern jarrah forest on vulnerable, shallow soils with limited water-holding capacity have experienced canopy die-off associated with acute drought and heatwave events (Matusick *et al.* 2013; Brouwers *et al.* 2013a).
- Although forest structure has changed at these sites, survival and recovery of individual trees highlights their ability to use groundwater where available, but not rely on it (Macfarlane *et al.* 2018).
- Studies of marri have shown that plants from warmer, drier areas have a greater capacity to cope with water deficit than those from cool, wet areas (Challis *et al.* 2022).
- Jarrah has a lower optimal seed germination temperature and a narrower range for germination compared to marri (Filipe *et al.* 2023).
- There is a higher prevalence of canker disease in marri in regions with higher rainfall (Paap *et al.* 2017), and drought conditions may increase the development of canker disease, particularly when followed by wetter conditions conducive to pathogen growth (Hossain *et al.* 2019). Provenances from cooler, wetter regions showed higher resistance to leaf blight (Duong *et al.* 2022).
- Climate change has also been implicated as contributing to declines of wandoo and canopy die-off events in tuart (*Eucalyptus gomphocephala*) and *Banksia* spp. (Brouwers *et al.* 2013b; Matusick *et al.* 2013; Challis *et al.* 2016).

Fauna

Species generally considered most vulnerable to climate change include those with restricted and/or fragmented ranges, low genetic variation, dependence on a particular disturbance regime and reliance on a particular moisture regime or habitat. Historically, many forest-dwelling mammal species had natural distribution ranges that extended into drier habitats to the north and east. The south-west forests are therefore considered a refuge for many species, and the potential contraction or degradation of forest habitat may be a particularly important aspect of climate-driven change in the short term for these mammal species. A range of other threatened and/or more forest-dependent fauna may also be at risk.

- By group, amphibians are considered the most vulnerable to climate change, followed by reptiles, mammals and birds (Steffen *et al.* 2009; Lee *et al.* 2015).
- On this basis, among the most vulnerable terrestrial vertebrates (not including fish) to climate change in the south-west forests include threatened frog species (orange bellied, white-bellied and sunset), western swamp tortoise, ngwayir and quokka (Gibson *et al.* 2010; Edwards and Roberts 2011; Mitchell *et al.* 2013; Molloy *et al.* 2014; Hoffman *et al.* 2021; Hoffman and Mitchell 2022).
- This is supported with modelling for quokka and ngwayir that suggests there may be substantial range contractions with continued climate change (Gibson *et al.* 2010).
- Potential stand-level die-off of vegetation in a drying climate will lead to changes in fauna ranges, foraging and community dynamics, habitat, and soil microbial communities (Gibson *et al.* 2010; Molloy *et al.* 2014; Hopkins *et al.* 2018; Angel *et al.* 2021; Dundas *et al.* 2021; Smithies 2022).
- Maintaining the connectivity of moist areas in forested landscapes, such as along vegetated riparian corridors, is essential for the survival and movement of some fauna populations (Gibson *et al.* 2010; Moore *et al.* 2015; Molloy *et al.* 2014).
- Potential consequences of climate change on invertebrate fauna are less well understood (Bain *et al.* 2019).
- Periodic outbreaks of endemic insects, such as jarrah leaf miner (*Perthida glyphopa*) and gum leaf skeletoniser (*Uraba lugens*), have historically caused broadscale defoliation of jarrah forest canopies and have been linked to fluctuations in amount and seasonality of rainfall (Wills and Farr 2017).
- As drought events and temperatures are anticipated to increase over the region, it is expected that the food resources during the breeding season for threatened cockatoos will become increasingly limited in time and space (Mastrantonis *et al.* 2019).
- Critical habitats of threatened fish such as Balston's and little pygmy perch, burrowing crayfish with restricted ranges and Carter's freshwater mussel are predicted to contract under the warming, drying climate increasing their vulnerability (Department of Conservation and Land Management 2008).

Carbon

Declining rainfall is expected to lead to long-term declines in the net primary productivity of forest ecosystems, and hence the carbon-carrying capacity of sites.

- At jarrah forest sites where the 2010/11 drought induced canopy die-off an average of 49 tonnes per hectare of live standing carbon was converted to dead standing carbon (Walden *et al.* 2019).

Fire frequency and behaviour

Climate change is affecting landscape dryness and fuel availability, and the frequency and intensity of extreme fire weather, causing the potential for bushfires to be more frequent, larger and more damaging. Continuing to focus prescribed burning efforts in landscape zones that protect settlements and other assets, combined with other risk mitigation activity, will mitigate bushfire risk to communities.

- An increased frequency of drought and heatwave events may increase the likelihood of bushfires starting and decrease the likelihood of their rapid suppression (Di Virgilio *et al.* 2019).
- In the Warren Region, the decade from 2002/03 onwards experienced the four most active lightning fire seasons on record and has seen the extension of the fire season into early spring and late autumn (McCaw and Read 2012).
- Climate projections forecast harsher fire weather conditions in the future with the number of days with 'severe' fire danger rating projected to increase 19 percent by 2030, based on the 1986-2005 period (Hope *et al.* 2015; DWER 2021b).
- Bushfires may occur earlier in the season, and prescribed burning windows are also shifting. This is both a challenge for fire management and may interact with the regeneration responses of plant populations (Miller *et al.* 2019, 2021).
- Plant populations may have reduced regenerative capacity, as maturation, growth, flowering and seedbank production is slowed by years of below-average rainfall pre-fire and seedling survival is impacted by post-fire drought (Enright *et al.* 2014, 2015).
- Drier landscapes make ecosystems previously protected by retained moisture such as riparian areas, swamps and peat systems vulnerable to burning. As well as impacting these systems directly, this also impacts their effectiveness in slowing or preventing fire spread and reduces landscape refuges and recolonisation nodes (Burrows and Middleton 2016).
- Peat wetlands that are drying due to climate change are more vulnerable to fire (Partridge and Finlayson 2022).
- Increased occurrence of fire interacts with other threats such as by enhancing the spread of invasive weed species (Bain *et al.* 2019).

4.2 Minerals and resource development

Commercial mining operations have been occurring in the south-west forests since the 19th century. The total area of forest directly cleared for mining purposes (excluding BRM) to June 2022 is estimated by the department at approximately 50,000 hectares, noting that mining may also have indirect impacts on forest ecosystems in a landscape setting (see Map 10). Petroleum exploration and development activities such as drilling and seismic surveys have also occurred historically in the south-west forests but have had limited long-term effects, particularly in regard to vegetation clearing and disturbance.

While mining for a variety of minerals has occurred, the commodities being extracted influence the level of direct and indirect impacts on the forest environment during and following mining operations.

Mining of coal, tin and certain other minerals often leads to deep and large-scale excavations, and the need for storage of non-productive material (tailings) at each site. Deep mining of coal over many years has resulted in deep mine voids and large waste landforms which are difficult and expensive to return to a state resembling natural forest ecosystems and uses. This leads to challenges in carrying out progressive rehabilitation and achieving mine closure outcomes that are both economically feasible and allow the return of the forest landform, soil profile, vegetation, and pre-mining land use.

Conversely, mining of bauxite and mineral sands has occurred since the 1960s and involves laterally extensive but relatively shallow excavation of mineral ore material and smaller volumes of material transfer. While usually directly and indirectly affecting more substantial areas of forest than open cut mining, these operations more readily permit progressive rehabilitation. In areas affected by these operations it may also be possible to establish post-mining landform and soil conditions that enable establishment of vegetation and fauna habitat elements with similarities to those occurring in natural forests. Despite intensive rehabilitation efforts, full return of the pre-existing soils, landforms vegetation and ecosystem functions after major disturbances may take hundreds of years or may never occur.

Mineral and petroleum exploration, extraction, and rehabilitation activities currently occur in the planning area and these are primarily approved and governed by processes managed by other government agencies under legislation such as the *Environmental Protection Act 1986* (EP Act), *Mining Act 1978* (Mining Act), *Petroleum and Geothermal Energy Resources Act 1967* (PGER Act) and various State Agreement Acts that take precedence over the provisions of the CALM Act (see Appendix 6). This legislation includes requirements for resource tenure and consent for activities in reserves as well as assessment, approval, management of environmental and other impacts, and rehabilitation and closure. The Minister for Environment has a role in many of these decisions and there is considerable input from the Commission and the department in relation to processes associated with assessment and approvals, oversight of current operations, development of rehabilitation requirements (including completion criteria) and post hand-back management of rehabilitated sites (see section 5.5.9).

Each year, approximately 1,000 hectares of State forests and timber reserves are subject to mining and petroleum operations, principally for extraction of bauxite (Darling Scarp north and east from Collie), coal (east of Collie) and gold (near Boddington). This could increase in the future with the expansion of existing operations, and if new mineral or petroleum deposits are identified and additional resource development proposals are approved.

While many areas affected by resource development activities are rehabilitated following disturbance, there may be enduring impacts on landform, habitat and biodiversity, ecosystem connectivity, soils, water, carbon, forest produce, and recreation values. In certain soil types, activities that alter groundwater levels have the potential to cause soil acidification, commonly through exposure of iron sulphides to air. The productive capacity of pine plantation areas on the Swan Coastal Plain may also be affected by large-scale mining of sand and limestone through changes to landform, soil profile and hydrology.

There has been an evolution of approval requirements and case-by-case assessment of resource development proposals over many decades. This has resulted in multiple rehabilitation prescriptions, completion criteria and closure and relinquishment processes established under State Agreement provisions, EP Act approvals conditions, Mining or PGER Act requirements and other arrangements for mining companies.

Where mining that is subject to environmental approval results in significant residual impacts on significant conservation values, including where these values occur within reserves, there is generally a requirement for proponents to provide environmental offsets to address these (DWER 2011). Environmental offsets may include undertaking activities on CALM Act lands, including State forest, provided the land is being managed for conservation purposes and the proposed activities are regarded by regulatory approval agencies as complementary and additional to standard management activities by the managing agency.



4.3 Inappropriate fire regimes

The south-west forest landscapes have evolved in the presence of fire. The biota of forest and shrubland ecosystems is resilient to a range of fire frequency and most flora and fauna species have adapted to coexist with fire to some extent. Species have a range of mechanisms to either survive through fire or recolonise into recovering habitat after fire. Fire becomes a threat to biodiversity and forest health if it lies outside the normal range of fire regimes.

Fire at varying frequency and intensity has been a periodic disturbance to ecosystems within the planning area, contributing to essential nutrient cycling, germination and habitat regeneration processes.

Warmer, drier conditions will influence the flammability of vegetation, particularly during periods of extended drought. An increased frequency of drought and heatwave events may increase the likelihood of bushfires starting and decrease the likelihood of their rapid suppression (Di Virgilio *et al.* 2019).

Large, high-intensity bushfires can be a threat to many values, including human communities and forest health. The short-term impacts of high-severity fires include the loss of greater numbers of animals, changed plant composition, and loss of refugia for wildlife and habitat features, such as tree hollows. Fauna recolonisation and vegetation recovery times, including replacement of tree crowns, may be relatively delayed in areas affected by high-severity fire, while increased loss of vegetation can cause soil erosion and sedimentation of waterways. Recovery can also be significantly hampered by weeds and feral animals. All of these can result in a changed trajectory with the system sometimes not returning to the pre-fire state.

Increased drought and heatwaves also influence the resilience of populations and ecosystems to fire. These conditions affect pre-fire seedbanks, resprouting resources for plants, condition of fauna, and make conditions for recovery of seedlings, and young animals after fire more challenging.

4.4 Weeds

Weeds are transforming Western Australia's landscapes, including the south-west forests. They pose a serious threat to ecosystem health, resilience and vitality. Many weeds are successfully invading natural areas, where they can disrupt or modify ecosystem processes, adversely impacting biological diversity at genetic, species and community levels.

Competition from weeds impacts many threatened flora and ecological communities in the planning area, particularly those restricted to small, disturbed areas highly vulnerable to invasion. Weeds can have an adverse effect on Noongar cultural heritage values. They can also increase fuel loads, affecting both the occurrence and frequency of bushfires.

There are 67 high priority weed species identified in the planning area (as of April 2023). Of these, six species are common – bridal creeper (*Asparagus asparagoides*), gladioli (*Gladiolous* sp.), narrowleaf cottonbush (*Gomphocarpus fruticosus*), blackberry (*Rubus* spp.), cape tulip (*Moraea* spp.), Victorian tea tree (*Leptospermum laevigatum*) and arum lily (*Zantedeschia aethiopica*). The department seeks to identify, monitor and manage priority weed species where possible.



Periwinkle weed (*Vinca major*), Beelu National Park - Lyn Marshall, DBCA

4.5 Pest animals

4.5.1 Pest vertebrates

Pest animals can present major threats to the health, resilience and vitality of forest ecosystems.

Vertebrate pest animals are often exotic species but may also include native Australian animals outside their natural range (for example, kookaburras, *Dacelo novaeguineae*) or native species that can have an undesirable impact on the ecosystem or forest values/assets (for example, grazing marsupials).

The European red fox and feral cat are the major causes of the decline or extinction of many Australian mammal species (Woinarski *et al.* 2015; Stobo-Wilson *et al.* 2022). Feral cat and fox activity is greatest, and native species most vulnerable, following disturbances such as fire and vegetation clearing (McGregor *et al.* 2016).

The arrival of the fox in the south-west region in the late 1920s coincided with a steep decline in the numbers of smaller native mammals in the southern part of the State. The effect of foxes on native fauna is emphasised by monitoring that identified areas baited for foxes had three times more individuals of native terrestrial vertebrates than areas not subject to fox management (Wayne *et al.* 2011).

Feral cats have a broad diet, taking prey up to the size of a koomal and quokka.

In Western Australia, mammal, bird, frog, reptile and fish species are vulnerable to predation by feral cats. Key native species that have experienced declines in the planning area due to feral cat predation include woylie/walyo, koomal, tjooditj, kwenda, numbat, western ground parrot, Gilberts potoroo and quokka.

Feral pigs (*Sus scrofa*) have multiple impacts on biodiversity values such as destroying vegetation leading to erosion along watercourses and siltation of waterways, outcompeting native animals for food, consuming eggs of native species and facilitating the spread of *Phytophthora* dieback. Those impacts are particularly evident along watercourses and in swampy areas. Seven genetically differentiated populations of feral pigs have been detected in the south-west region (Spencer and Hampton 2005) with six of these occurring within the planning area. Due to habitat requirements the movement and dispersal of feral pigs occurs primarily along water courses (Hampton 2003), and from their illegal movement, presumably by recreational hunters (Spencer and Hampton 2005).

Feral goats and horses have established across the Western Australian landscape, although populations are restricted to specific locations within the planning area. Feral goats and horses are known to occur around Lake Muir in the Warren Region, impacting the natural environment by spreading disease, weeds and degrading waterways.

Three species of deer have established free-ranging populations in Western Australia (Long 2003). Distribution and abundance of feral deer in the planning area are believed to be small and localised. Feral deer are known to occur in the Lake Muir, Perth Hills, and Harvey areas. They can significantly impact vegetation communities, spread weeds, and cause soil erosion.

4.5.2 Pest invertebrates

Invertebrate threats to forest ecosystem and plantation health arise from two sources: endemic insects which outbreak, or invasion by exotic pests.

The two most notable endemic insect pests of forest trees in the planning area are jarrah leaf miner and gum leaf skeletoniser, which can cause widespread, temporary canopy defoliation. Research by the department suggests that drier, warmer winters and autumn drought expected with climate change may lead to more frequent outbreaks of gum leaf skeletoniser but may result in reduced impacts from jarrah leaf miner.

Other endemic invertebrate pests with consequences for tree health (particularly in overstocked regenerating stands) include endemic longicorn borers (*Phoracantha* spp.). These species are known to be responsive to physiological stress



Fox captured on remote camera - DBCA



Feral pigs Dwellingup - Stephen Crane, DBCA

in trees induced by extremes of temperature and drought. Some tree decline syndromes such as wandoo decline result from an interaction of both pathogen and insect responses to a drying climate.

Feral bees compete with native bees, can displace native fauna from tree hollows, and can disrupt pollination mechanisms of native flora. Competition for hollows by introduced birds and other species such as feral bees may limit their availability for native species. Feral bee colonies can also occupy recreation infrastructure and aggregate at water sources, disrupting their amenity for recreation and tourism.

There are numerous other potential pest species not yet detected in Australia that have the potential to damage forest health if introduced. Biosecurity is essential to protect forest ecosystems from potential future pest outbreaks.

4.6 Diseases

The agents of plant disease and tree decline can be biotic, abiotic, or a combination of both. Abiotic plant diseases occur when plants are exposed, often over extended periods, to sub-optimal conditions. Under a changing climate, these conditions are predicted to increase in intensity and duration in the south-west region, placing additional stress on plant communities. Plant pathogens, which are biotic factors, are known to contribute to ‘tree declines’ that have been observed for several decades in the south-west forests, affecting a range of key species including tuart, flooded gum, wandoo, red tingle (*E. jacksonii*) and marri.

Phytophthora dieback attacks the roots of plants, cutting off water and nutrients to the crown (leaves and branches), resulting in plant death. In Western Australia’s south-west bioregion, more than 40 percent of native plant species are considered susceptible to the disease including many banksia, hakea, eucalypt and grass-tree species. Threatened flora are at even greater risk with around 56 percent being considered susceptible (Shearer *et al.* 2004). A drying climate is likely to increase pressures on ecosystems, which could increase the impact *Phytophthora* and other plant diseases have on the vegetation assemblages.

Apart from the direct impacts of *P. cinnamomi*, the indirect effects of loss of canopy and understorey and increased area of bare ground are thought to extend to groups of fauna and non-susceptible flora, natural and cultural heritage values, carbon stores, soil microbial profiles, site hydrology, susceptibility to fire, and weed invasion. These effects are likely to be exacerbated with a drying climate.

As of December 2021, at least 242,100 hectares of CALM Act lands in the planning area are known to be infested with *P. cinnamomi* (see Map 11). Several other *Phytophthora* species contribute to the decline in health of forest ecosystems, though further research is required to ascertain their importance and to develop appropriate management responses.

There are other key biosecurity threats of management significance should they spread to the forests in the planning area. One example is the polyphagous shot-hole borer (*Euwallacea fornicates*), a tiny beetle native to south-east Asia which has a symbiotic relationship with *Fusarium* fungus. Polyphagous shot-hole borer is known to cause *Fusarium* dieback in more than 400 host species overseas, and is recognised as a significant environmental, forestry and agricultural pest.

Myrtle rust (*Austropuccinia psidii*) is another threat which is established in eastern Australia and detected in northern Western Australia in 2022. Myrtle rust could have major impacts in our south-west forests if it is introduced, causing dieback and death of Myrtaceous plants, which include eucalypts, bottlebrushes, peppermint trees and melaleucas. It is unknown what the impact of Myrtle rust will be as the climate changes.

There are several tree declines in the south-west of Western Australia that have been in progress for several decades affecting tuart, flooded gum, wandoo and red tingle as well as marri canker and blight. Several plant pathogens are implicated as contributing factors in tree declines: *P. multivora* in tuart decline, *P. multivora* and several other *Phytophthora* species in flooded-gum decline. The native fungal plant pathogen *Quambalaria coyrecup* is the main contributing and highly visible factor in marri canker, and where *Phytophthora* species are present the incidence of marri canker is greater. Human disturbance appears to be a consistent predisposing factor in tree decline (Sapsford *et al.* 2021).



Myrtle rust on wandoo - L Morin, CSIRO



MAP 11

4.7 Unauthorised activities

Unauthorised activities can cause environmental degradation, destruction or degradation of Noongar cultural heritage sites, affect visitor experience and satisfaction, and impact visual quality and amenity of the planning area.

The most common unauthorised activities in south-west forests are illegal dumping, illegal or inappropriate use of motorised vehicles (including motorcycles), construction and use of unsanctioned tracks and trails and collection of firewood in unsanctioned areas. Unlawful vegetation clearing, illegal campfires, and large gatherings and parties, have also been identified as management challenges for the department.

Community feedback indicates concern about the level of illegal dumping and littering in forests and also highlights the need to restrict vehicles off-road, particularly in disease-risk areas and sensitive sites. In other locations, there may be a need to identify additional designated areas for off-road vehicle users.

Unauthorised and illegal activities in natural areas close to Perth are more prevalent due to the proximity to major population centres, as larger populations often lead to increased demand for access, facilities and services. This leads to a greater likelihood of unauthorised activity in parks, reserves and forest areas close to Perth.



Illegal dumping, Perth Hills - Doug Giles, DBCA

4.8 Other native vegetation clearing

As discussed in Section 4.2, clearing of native vegetation may be authorised by other decision-making authorities, consistent with the relevant legislation. The department may also authorise clearing of native vegetation in accordance with the CALM and BC Acts.

Maintaining the total area of forest and minimising fragmentation arising from permanent clearing are key elements of biodiversity conservation strategies. Historically, a large network of infrastructure associated with essential public or private utilities has been developed on lands (primarily State forest) vested in the Commission within the planning area. Applications for these activities are considered by the department on a case-by-case basis. Clearing followed by revegetation occurs in areas associated with a number of non-permanent disturbance activities.

At a local level, vegetation clearing may be undertaken by the department for activities such as fenceline or firebreak construction, or for recreation site developments, and track and trail alignments. As well as the direct loss of native vegetation and habitat, permanent infrastructure corridors, tracks and trails can increase opportunities for the introduction and spread of weeds, pest animals and plant diseases such as *Phytophthora dieback*.

4.9 Soil degradation

Soils degraded through erosion, compaction or salinisation have altered chemical properties which can adversely affect associated ecosystem and hydrologic processes and water quality. Activities which result in major soil disturbance include the use of heavy vehicles, road construction and maintenance, planned and unplanned fire, and excavation of acid sulphate soils. Chemical contamination of soil can result from the misuse or spills of solvents, pesticides, herbicides and fuel spills. Disturbance to vegetation from mining, prescribed burning, pest animals, grazing, roading, and other approved activities can cause erosion and may result in decreased soil fertility, increased surface water flows and sediment delivery to streams and rivers.

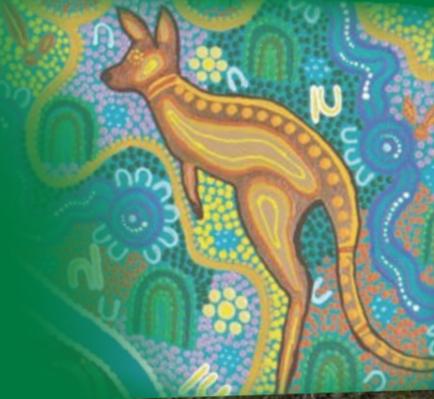
While evidence suggests that climate-induced lowering of groundwater may reduce salinity risks within forested catchments, salinisation of valley floors and stream salinity remains a problem originating from cleared areas in the vicinity of the planning area. Management of salinity on these lands is not subject to this plan.

In certain soil types, activities that alter groundwater levels have the potential to cause soil acidification, commonly through exposure of iron sulphides to air. Activities that may activate acid sulfate soils include mining, road construction, and excavation, as well as direct drawdown of groundwater by pumping.



Access road Perth Hills - DBCA

5 Part C – Managing our south-west forests



Greater Beedelup National Park - Bron Anderson, DBCA

Combined with other pressures – invasive pest animals, weed and plant disease spread, high intensity bushfires and human use – the cumulative effects of climate change are likely to have significant impacts on some south-west landscapes. In a recent global review of future climate impacts on Mediterranean biomes (including the jarrah/marri forests), Safford and Vallejo (2019) considered changes in forest structure, function, composition and dynamics are inevitable but of uncertain magnitude and direction.

Safford and Vallejo (2019) concluded that a range of active management tactics undertaken within an adaptive management framework should be considered to increase resilience of forest ecosystems to further impacts. These include:

- maintaining a comprehensive conservation reserve system, with complementary management for biodiversity outcomes in broader landscapes
- providing for habitat connectivity to assist species migration and habitat protection across scales of management, through the retention of vegetated corridors or zones
- increasing landscape and habitat heterogeneity
- implementing active or passive forest treatments that restore resilience at large spatial scales, such as reducing drought stress, fire risks, and/or reducing forest density and homogeneity, and
- mitigating threats posed by invasive species, diseases, deforestation or land use changes.

The strategic goals, management objectives and management activities developed in this plan are responsive to these recommended tactics.

The operative text of the plan, as required by section 55 of the CALM Act, is contained in Parts C and D and any associated appendices.

These Parts describe the policies and guidelines proposed to be followed and the purpose, term and operations of the plan proposed to be undertaken during the term of the plan. Parts C and D indicate how the reserves in the planning area will be managed in accordance with the CALM and BC Acts, other departmental policies and other legislation.

The strategic goals have been developed in the context of relevant legislation, government policy, Commission and

departmental policy, community feedback, ESFM principles and Montreal Process Criteria. Under each strategic goal, management objectives and activities have been designed to address identified pressures and/or protect specific values that reflect the objectives of the CALM Act. Each strategic goal also has a KPI, which is comprised of measures (indicators of effectiveness in achieving management objectives) and targets (specific end points of management; providing a benchmark to assess the level of success of management responses).

The strategic goals are presented in Part C as four management foundations:

1. Noongar cultural heritage and management partnerships.
2. Biodiversity conservation.
3. Forest health and climate resilience.
4. Social and economic benefits and opportunities.

Contextual information on policy (including management considerations) influencing management objectives and activities is included in each foundation. Existing [Commission position statements](#)¹⁵ and [DBCA policies](#)¹⁶ and guidelines that support, or have relevance to the management objectives and activities, are listed in the respective summaries.

There is a range of other regional, State and national policies and strategies that may be relevant to the plan. Where required, or appropriate, the Commission and the department endeavour to ensure that activities are aligned with these. These other documents are not necessarily identified within this plan.

It is important to note that many management activities support objectives across multiple foundations. To avoid duplication, management activities are allocated to a single foundation, which best represents that activity.

5.1 Term and operation of the plan

This plan will come into operation on 1 January 2024 and unless sooner revoked, will continue to operate until 31 December 2033. The gazetted plan will replace FMP 2014-2023. The plan will be implemented according to available resources.

The FMP reflects and gives effect to elements of the WA RFA, including establishment and ongoing enhancement of a CAR reserve system, addressing climate change implications on the sustainability of forest uses and appropriate periodic assessment. The bilateral RFA agreement largely removes the need for approvals under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) for forest operations undertaken in accordance with the RFA, recognising that State-level processes provide the necessary environmental controls. Wood sourced from an RFA forest is also exempt from requiring an export licence under the *Export Control Act 2020* (Cth).

In the following parts of this plan, reference is made to various policies and guidelines of the department (and in some cases, where relevant, those of others endorsed by the department). These policies and guidelines are strategic and address major business obligations, services and matters of corporate significance. These may be revised from time to time or be replaced during the term of the plan. Other relevant policies and guidelines may be developed during the term of the plan that the department (and others, where required) may also need to have regard to when undertaking proposed management activities.

5.2 Management context

CALM Act management plans are designed to achieve or promote the purpose for which land is reserved. In particular, section 56 of the CALM Act specifies the purposes for managing different land categories.

Indigenous State forests and timber reserves are managed for the purpose, or combination of purposes provided for in a management plan. Those purposes must be drawn from the purposes specified in section 55(1a) or prescribed in Regulation 81 of the Conservation and Land Management Regulations 2002 (CALM Regulations).

¹⁵ conservation.wa.gov.au/publications/position-statement

¹⁶ dbca.wa.gov.au/about-us/legislation/corporate-policies

Indigenous State forest and timber reserves will be managed under this plan for a combination of the following purposes:

- Conservation.
- Recreation.
- Water catchment protection.
- Each of the other purposes prescribed by Regulation 81.

The purposes prescribed by Regulation 81 allow the taking, storage and removal of water; the location of infrastructure, and other similar facilities that serve the public interest, to the extent to which this is not inconsistent with the other purposes for which the land is reserved; and the removal of salvaged forest products, if the opportunity for the salvage arises from an activity carried out for a conservation purpose (for example, ecological thinning), clearing for mining, or clearing for infrastructure and other similar facilities that serve the public interest.

State forest or timber reserves which are planted with exotic species (plantations) are to be managed to achieve the optimum yield in production, consistent with the satisfaction of long-term social and economic needs.

The purpose of national and conservation parks is to fulfil so much of the demand for recreation, as is consistent with conservation of the natural environment, the protection of flora and fauna, and the preservation of any feature of archaeological, historic or scientific interest.

The purpose of nature reserves is to conserve the natural environment, protect, care for and promote the study of flora and fauna, and to preserve any feature of archaeological, historic or scientific interest.

Management of section 5(1)(g) and 5(1)(h) lands is based on the purpose for which the land has been vested.

In accordance with section 56(2) of the CALM Act, this management plan also has an overarching objective to protect and conserve the value of the land to the culture and heritage of Aboriginal people. This objective prevails over an objective set out in section 56(1) where they conflict or are inconsistent.

Multiple agencies, land managers and proponents conduct activities or have responsibilities in the planning area; the department works cooperatively with these parties in the interests of effective management.

The strategic goals, management objectives and management activities in this plan have been designed to advance the purposes outlined above. Management activities will be differentially applied so that they are consistent with the purpose for which particular land is reserved. A description of the purposes that management objectives and activities contribute to, and which land categories they apply to, is provided in each section within Part C.

5.3 Foundation 1: Noongar cultural heritage and management partnerships

Strategic goal: To value and protect Noongar cultural heritage and support Noongar Traditional Owner involvement.

Foundation 1 covers cooperative and joint management arrangements, how Noongar cultural heritage will be valued and protected and how Noongar Traditional Owners will be involved in forest management and the implementation of this plan.

5.3.1 Cooperative and joint management

Through the Settlement, Noongar people and the department will enter into formal agreements to recognise their mutual rights and obligations in managing the South West Conservation Estate (i.e., CALM Act land). These cooperative and joint management arrangements will be established in a two-staged process. Six Cooperative Management Agreements, one for each of the six Noongar Agreement Areas, will be signed by the department and the relevant Noongar Regional Corporation. The agreements will apply to the whole of the South West Conservation Estate within that Agreement Area. Once established, the Cooperative Management Committees will, among other things, work to identify and prioritise specific areas of the South West Conservation Estate to be jointly managed by Joint Management Bodies (JMBs) established under Joint Management Agreements (JMAs). See Map 4 and Appendix 5 for further details.



Elders, Aboriginal rangers, archeologists and DBCA staff discuss prescribed burn at William Bay National Park - Sonya Stewart, DBCA

Under the CALM Act land can be vested jointly in the Commission and an Aboriginal body corporate. The Settlement provides a comprehensive and wholistic governance framework for the management of the South West Conservation Estate.

New partnerships offer the potential for improved understanding of Noongar traditional knowledge and customary practices with associated values, protocols and management systems applicable to forest management in a respectful way. These partnerships also highlight opportunities to integrate traditional knowledge with contemporary science, to inform forest management outcomes. They will also provide awareness and understanding about mutual benefits of current and future practices that may contribute to social and economic outcomes for Noongar people.

Opportunities for employment will deliver a range of social, cultural and economic benefits for Noongar people across boodjar, and align closely with whole-of-government initiatives such as [Closing the Gap](#)¹⁷, the [Aboriginal Empowerment Strategy](#)¹⁸, and the [Aboriginal Procurement Policy](#)¹⁹. Opportunities may arise to manage forest-based resources, including activities such as weed management or seed collection.

5.3.2 Protection of Noongar cultural heritage

Significant progress has been made by the department over the last decade in recognising and understanding what the concept of protecting and conserving the value of the land to the cultural heritage of Aboriginal persons entails. Aboriginal cultural heritage values are dynamic and all-encompassing, and include physical, spiritual and social elements that are both tangible and intangible. As well as focusing on protection of tangible values such as culturally significant sites, this plan recognises the broader landscape and intangible values and concepts including traditional knowledge, cultural responsibilities and practices, and associations with specific plants and animals.

All Aboriginal sites, registered or otherwise, are protected under the *Aboriginal Heritage Act 1972* (AH Act). The amended AH Act provides a legislative framework to protect and manage Aboriginal heritage in Western Australia. The AH Act offers improved protection for significant sites and Aboriginal heritage.

Provisions of the CALM Act enable Aboriginal people to access country and undertake customary activities, such as hunting and gathering food and medicine, camping outside designated camping sites, and engaging in artistic or ceremonial activities on land vested in the Commission. While most customary activities can be carried out without impacting on biodiversity and public safety, regulations exist that restrict customary activities where there are real and significant risks to public safety and flora and fauna values. If Noongar people wish to undertake restricted activities,

¹⁷ closingthegap.gov.au

¹⁸ wa.gov.au/organisation/department-of-the-premier-and-cabinet/aboriginal-empowerment-strategy-western-australia-2021-2029

¹⁹ wa.gov.au/government/publications/general-procurement-direction-202108-aboriginal-procurement-policy

informal agreements known as local area arrangements can be negotiated between DBCA and specific groups and families to ensure public safety and the protection of both the cultural and environmental values of country.

A summary of management objectives and management activities (management directions) and related policies and guidelines for Foundation 1 – Noongar cultural heritage and management partnerships is outlined in Table 3, with the associated KPI outlined in Table 4. Management directions for this foundation are not specific to a land category and contribute to the purpose of determining the value of the land to the culture and heritage of Aboriginal people.

Table 3: Summary of management directions for Noongar cultural heritage and management partnerships.

Key points and considerations	
<ul style="list-style-type: none"> The Noongar people are recognised as traditional owners of the south-west region of Western Australia and the planning area. Noongar Traditional Owners have responsibilities for looking after boodjar (land/country). Noongar people bring unique kadidjiny (knowledge), perspectives of boodjar and its biodiversity and have a duty to pass on knowledge to younger generations and help Noongar culture to remain strong. A large number of significant Noongar sites have been recorded in the planning area, many of which are still used today. Other culturally important sites and places are not registered. The Noongar peoples' strong relationship to boodjar is reflected in the many components of the Settlement, including cooperative and joint management arrangements of the South West Conservation Estate. The planning area constitutes about two-thirds of the Estate. 	
Management objectives	Management activities
1. Partner with Noongar Traditional Owners through Cooperative Management Committees to protect Noongar cultural heritage values in the planning area.	Collaborate with Noongar Traditional Owners to protect cultural heritage in accordance with the Aboriginal Heritage Act and protocols established under Cooperative Management Agreements and Cooperative Management Committees. Promote awareness of Noongar cultural heritage values with departmental staff, volunteers and contractors.
2. Support Noongar Traditional Owners to carry out customary activities in the planning area.	Explore opportunities with Noongar Traditional Owners to determine sites of high cultural sensitivity in the planning area that may require special protection including access arrangements.
3. Support Noongar employment and economic development opportunities in the planning area.	Continue to enable and support Noongar customary activities. Through cooperative and joint management arrangements, seek to develop approaches for two-way sharing knowledge of Noongar kadidjiny and Western science into forest management. Endeavour to increase employment and training of Noongar Traditional Owners to participate in on-ground management in the planning area.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 18: Protect and conserve the value of the land to Aboriginal persons Corporate Policy Statement 86: Aboriginal customary activities Corporate Policy Statement 87: Aboriginal joint management Corporate Guideline 11: Development and management of Aboriginal joint management arrangements Corporate Guideline 22: Aboriginal customary activities	

Table 4: Key performance indicator: Foundation 1

Engagement and involvement of Noongar Traditional Owners in management of lands covered by the plan	
Strategic goal	To value and protect Noongar cultural heritage and support Noongar Traditional Owner involvement.
Performance measures	Management targets
Level of engagement with Noongar Traditional Owners through Cooperative Management Committees, including employment and economic opportunities.	Cooperative Management Committees provide input to support management, employment and economic development, to further the terms of the Settlement.
Noongar Traditional Owners are able to access the planning area for customary activities and fulfilling responsibilities to boodjar (land/country) and culture.	Local area arrangements and protocols for customary activities continue to be established and implemented within each ILUA area covered by the plan.

5.4 Foundation 2: Biodiversity conservation

Strategic goal: To conserve biodiversity and support ecosystem resilience.

Biodiversity of south-west forests is a key value that is highly regarded by the community and a fundamental consideration of ESFM. This foundation covers three related aspects of biodiversity conservation:

1. Maintaining and expanding the conservation reserve system across the planning area.
2. Conserving biodiversity and biodiversity components, utilising the frameworks that the department uses to plan for, and manage biodiversity.
3. Managing and reducing the impact of permitted disturbance activities on biodiversity, through advisory and rehabilitation processes.

5.4.1 Maintaining and expanding the conservation reserve system

The development of the State's conservation reserve system commenced in the 1890s with an emphasis on providing for landscape and recreation, over biodiversity and habitat protection. State forests were created to conserve forests from land settlement and clearing policies for agricultural development. Over time, the rationale for creating conservation reserves reflects changing political and societal views regarding the relative importance of competing land uses.

Since the 1990s conservation of forested areas has been undertaken consistent with the *Nationally Agreed Criteria for the Establishment of a Comprehensive, Adequate and Representative Reserve System for Forests in Australia* (Commonwealth of Australia 1997); referred to as the CAR reserve or conservation reserve system.

The CALM Act provides objectives for conservation reserve types, which reflect the values an area contains together with the long-term use of those areas. A description of the various reserve categories, classifications, and purposes which contribute to the conservation reserve system and that are relevant to the planning area is provided in Appendix 1a.

There is no reserve category that in itself prohibits disturbance activities, including mining, from occurring. The reserve category is taken into consideration for consent processes under the Mining Act (see Appendix 6) and may be taken into consideration for proposals being formally assessed under Part IV of the EP Act.

The RFA process in combination with previous FMPs has resulted in recommendations for significant additions to be made to the conservation reserve system to meet established CAR targets. When formally implemented these reserve recommendations will meet reserve criteria and CAR targets for the FMP area. Proposed reserve categories are shown in Map 12 and listed in Appendix 7. For the period of this plan, maintaining and expanding the CAR reserve system through implementing the commitments identified in previous FMPs is a priority. Consultation with the relevant agencies on some of these earlier proposals is in progress, while others are yet to commence. Consistent with the Noongar Land Base Strategy, a number of reserve recommendations are under consideration for inclusion in the Noongar Land Estate. This includes unallocated Crown land and unmanaged reserves. If identified for inclusion in the Noongar Land Estate these areas will no longer contribute to the areas identified in previous FMPs.

State forests have been managed for multiple uses, including conservation, over many decades and have biodiversity and other values. In addition to the commitments of previous FMPs, this plan provides for a process to investigate areas of State forest and timber reserves that are no longer available for large-scale commercial timber harvesting for their suitability for inclusion in new or expanded conservation reserves, including national parks, conservation parks and nature reserves. Following consideration of anticipated future activities and uses, determination of appropriate reserve boundaries and type will occur in consultation with traditional owners and stakeholders; including the mineral and petroleum resources sector, conservation groups, local government, and other forest-based industries and businesses. There is also an opportunity to include areas of regrowth forest, including some of those that have been ecologically thinned, into new or expanded conservation reserves. Some ecological thinning candidate areas shown on Map 13 overlap with indicative areas for increased protection.

Consideration of the remainder of State forest, including in State Agreement Act areas (other than plantations) will also be undertaken for addition to the conservation reserve system. In general, and unless otherwise stated therein, State Agreement Acts override provisions of other legislation such as the Mining Act and the CALM Act where there may be inconsistencies. Consequently, the agreement of the relevant State Agreement Act party will be required for these reserve proposals to progress.

Implementing existing reserve recommendations and progressing indicative areas for increased protection will cumulatively lead to a change in the reserve category for more than 700,000 hectares. Consideration of the remainder of State forest may further add to the area identified for increased protection over the life of the plan.

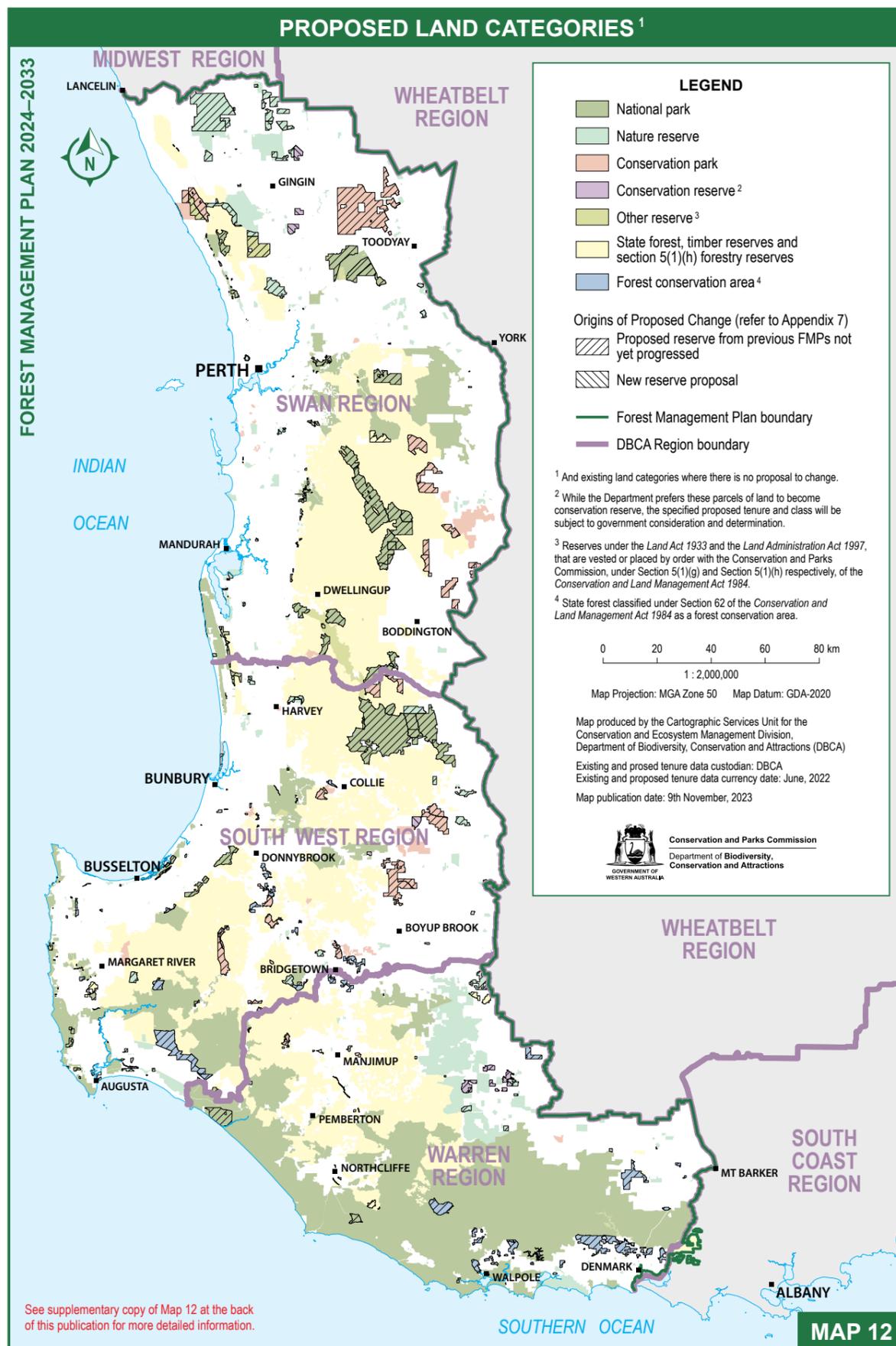
It is intended to progress the three streams of investigations concurrently which will lead to progressive additions of at least 400,000 hectares to the conservation reserve system by 2033. Initial priorities for investigation for indicative areas for increased protection are illustrated in Map 13.

Formal tenure proposals are subject to lengthy processes and a number of considerations, including consultation processes, Statewide priorities and available funding. DBCA will then initiate the land category change process by undertaking fine-scale reserve design. The reserve design process is outlined in Appendix 9. Following the consultation and reserve design process, DBCA will consult with the Commission prior to advising the Minister for Environment on recommended final reserve boundaries.

In order to consider the extent to which CAR targets are being met, percentage representation of forest ecosystems in existing and proposed reserves, and indicative areas for improved protection, is provided in Appendix 8.

This plan also proposes activities at the whole of forest scale for the purpose of complementing the function of the formal conservation reserve system in the conservation of biodiversity. FMP 2014-2023 applied several mechanisms to achieve this outcome, including forest conservation areas (FCAs), established under section 62(1) of the CALM Act. FCAs were applied in locations where there was an impediment to being considered for a formal reserve category (for example, resource development) but where maintenance of biodiversity values was a priority. In FMP 2014-2023 FCAs were not available for timber harvesting. Areas that have been identified in the two prior FMPs as FCAs will be reviewed for the suitability of that classification. FCAs may be applied through the land category review process where it provides an additional mechanism to restrict specific activities in designated areas in order to maintain biodiversity values.

In addition, FMP 2014-2023 continued a network of areas defined as 'Informal reserves', and revised a network of Fauna Habitat Zones, all of which were identified and managed to prevent or minimise disturbance on particular forest values, primarily from timber harvesting.



Informal reserves are relatively undisturbed areas distributed across State forest and timber reserves to protect aquatic ecosystems, provide connectivity, landscape heterogeneity and stand structural complexity, thereby making an important contribution to conservation outcomes. It is intended to maintain the system of Informal reserves and Fauna Habitat Zones within State forest and timber reserves, as a means of continuing to minimise any form of disturbance to the values they contain. While disturbance from commercial timber harvesting will no longer occur, other disturbances may be proposed, including ecological thinning. Consequently, to retain visibility of these values and ensure their consideration in planning processes, these informal reserves and Fauna Habitat Zones will collectively be renamed as Disturbance Avoidance Zones. Definitions of these zones are provided in Appendix 1c.

Old-growth forest outside the existing or proposed formal reserve system was previously an informal reserve type, with processes requiring checking for the presence of unmapped old-growth forest prior to disturbance activities occurring. There may be additional areas of old-growth forests in State forest and timber reserves, which may be identified as part of pre-disturbance planning. On identification, these will be included in the Disturbance Avoidance Zone network.

A summary of management directions for maintaining and expanding the conservation reserve system is outlined in Table 5, with the associated KPI for Foundation 2 – Biodiversity conservation outlined in Table 8. These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose. With respect to State forest and timber reserves, these directions also support purposes of recreation and water catchment protection.

Table 5: Summary of management directions for maintaining and expanding the conservation reserve system

Key points and considerations	
<ul style="list-style-type: none"> The establishment and maintenance of a CAR reserve system is fundamental to the conservation of biodiversity in the planning area. Existing proposals for creation of reserves are to be carried forward in this plan. Areas of State forest and timber reserves are proposed to transition to different conservation classifications. Informal reserves and Fauna Habitat Zones are proposed to be collectively renamed as Disturbance Avoidance Zones. Old-growth forest remains a key value within the conservation reserve system. 	
Management objectives	Management activities
1. Conserve biodiversity and self-sustaining populations of native species and communities through a system of reserves that is comprehensive, adequate and representative.	<p>Progressively review and implement tenure changes to achieve reservation targets (Appendix 7).</p> <p>Progressively assess indicative areas (and other areas where appropriate) for increased protection based on reserve design principles, and traditional owner and stakeholder consultation processes.</p> <p>Engage with State Agreement Act holders on creating protected areas in the northern jarrah forest to meet CAR targets.</p> <p>Prepare proposed boundaries for consultation purposes for the 400,000 ha of indicative areas for increased protection by year five.</p> <p>Pursue opportunities to implement land category changes for indicative areas for increased protection.</p> <p>So far as possible, make decisions and advise external decision-makers on proposed activities or permitted disturbances in areas proposed for reserves (Appendix 7) consistent with the intended land category.</p> <p>Consider future uses of indicative areas for increased protection when providing advice on proposed activities or disturbances in these areas.</p>
Relevant Commission position statements and DBCA policies and guidelines	
<p>Position Statement 2: Conservation reserve system proposals for lands vested in the Conservation and Parks Commission</p> <p>Corporate Policy Statement 36: Conservation reserve system</p> <p>Corporate Policy Statement 62: Identification and management of wilderness and surrounding areas</p>	

5.4.2 Conserving biodiversity

The department has a strong focus on conserving biodiversity, both within the conservation reserve system and across the wider landscape. Populations of threatened and priority flora and fauna, and TECs and PECs, occur within the planning area and protection of these is considered through processes relating to species and communities listing, determining conservation status and recovery planning.

The BC Act provides a statutory basis for the listing of threatened species, specially protected species, TECs, critical habitat and key threatening processes. Priority plants, animals and ecological communities are possibly threatened but do not meet listing criteria because they are poorly known (for example, do not meet survey criteria or are data deficient) or they are adequately known but are rare, near threatened, or have been recently removed from the threatened species list.

Guidance documents, such as recovery plans and other approaches, can be prepared for the conservation, protection and management for one or more threatened species or TECs, or a combination of threatened species and TECs. Under the BC Act a recovery plan must provide for research and management actions to stop the decline, and support the recovery, of each threatened species or threatened ecological community so that its chances of long-term survival in the wild are maximised. Interim recovery plans may be prepared where a plan is required but where there is insufficient data available to prepare a full recovery plan. Lists of threatened flora, fauna, and threatened and priority ecological communities that have recovery plans are available on the [DBCA website](#)²⁰.

Biodiversity conservation is implemented through targeted management actions. These are informed by reserve management plans, regional conservation plans that outline prioritised conservation actions for each of the three departmental regions in the planning area, and actions for threatened and priority species and ecological communities as identified in recovery plans, or by recovery teams. Actions may include protecting habitat, rehabilitation, maintaining populations, surveys, population supplementation and translocations, monitoring, and undertaking research to address knowledge gaps. Ex-situ conservation actions are also important to achieving successful biodiversity conservation outcomes, including seed banking, maintaining living collections and captive breeding.

In this regard, the FMP, regional conservation plans and other guidance documents are complementary and identify priority conservation actions to be undertaken to maintain or improve status and condition of key biodiversity values.

A summary of management directions for integrated planning for biodiversity is outlined in Table 6, with the associated key performance indicator for Foundation 2 – Biodiversity conservation outlined in Table 8. These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose.

Table 6: Summary of management directions for conserving biodiversity

Key points and considerations
<ul style="list-style-type: none"> • South-west forests are rich in biodiversity at genetic, species and ecosystem levels. • Biodiversity conservation planning processes are undertaken to ensure that threatened and priority species and communities, particularly in the conservation reserve system, are managed. • Management under the FMP complements regional conservation plans, reserve management plans and recovery plans for threatened species and communities. • Priority conservation actions will be undertaken to manage, conserve and enhance biodiversity and biodiversity components and support ecosystem resilience.

Table 6 (continued): Summary of management directions for conserving biodiversity

Management objectives	Management activities
1. Conserve and protect biodiversity including threatened and priority species and ecological communities in the planning area.	Where possible implement priority conservation actions and undertake monitoring for biodiversity.
	Undertake research into conservation of biodiversity to inform management actions.
	Undertake targeted biological surveys in poorly sampled forest ecosystems where required to improve understanding of biodiversity and inform conservation management actions.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 35: Conserving threatened species and ecological communities Corporate Guideline 35: Listing and conservation of species and ecological communities Corporate Guideline 36: Conservation of species through translocation, captive breeding and seed production areas Corporate Guideline 37: Assessing risks to the conservation of biodiversity associated with threatened species and threatened ecological communities	

5.4.3 Managing permitted disturbance activities

Different types of permitted disturbance activities have different impacts, varying in scale and duration. Key large-scale disturbances with potentially significant impacts on biodiversity include mining activities, and regional infrastructure development and maintenance.

Exploration, extraction and rehabilitation activities relating to resource development activities (mining or petroleum) operations and infrastructure are predominantly approved through processes managed by other government agencies under legislation such as the EP Act, Mining Act, PGER Act and State Agreements. In addition, land use change proposals may be considered through planning processes under the *Planning and Development Act 2005*.

The Commission and the department provide advice in relation to these processes, associated with protection and management of biodiversity values, approvals, oversight of proposals being implemented, development of rehabilitation requirements and completion criteria for hand-back of rehabilitated sites (also see 5.5.9 in Foundation 3). Where appropriate, general guidance is also developed by the department and provided to industry and external regulatory agencies to assist in applying best practice to the assessment and management of impacts on biodiversity values.

This advice may relate to:

- avoiding, minimising, mitigating and/or offsetting the permanent loss of native vegetation and/or impacts on its integrity
- promoting the construction of linear infrastructure in corridors, while minimising construction in sensitive areas
- minimising impacts to cultural values, visual amenity, natural scenic qualities, and significant landscapes, and
- determining post-disturbance land use.

The department’s Disturbance Approval System (DAS) is used to assess impacts of planned disturbance activities or necessary operations on CALM Act lands, other than from resource development activities. The purpose of DAS is to inform the assessment of risk to environmental, social and economic values of a proposed activity. This helps to ensure approved activities are consistent with departmental objectives, management plans and land use categories, and minimises impacts on identified values.

DAS provides a comprehensive checklist of environmental and cultural assessment questions consistent with the seven Montreal Criteria to ensure that all relevant factors of a proposed disturbance are assessed. Among other factors, populations and occurrences of threatened species and communities are considered and any measures to protect

²⁰ dbca.wa.gov.au/management/threatened-species-and-communities

them are determined and included in the conditions of approval, if granted by the department. The system provides a consistent, accessible mechanism for all disturbance activities (except resource development activities) to be assessed, enabling consideration to be given to avoiding or mitigating impacts on biodiversity and conservation assets.

Numerous planned disturbances and developments proposed by the department and other proponents require assessment and management through DAS. These include recreation site development, access maintenance, and work carried out on boundaries of prescribed burns and bushfires. It is proposed that individual ecological thinning operations will also be assessed and managed through DAS.

Given the potential cumulative, long-term impacts on biodiversity and the conservation reserve system from disturbances and developments, this plan includes a number of proposed management, monitoring and reporting activities.

A summary of management directions for managing permitted disturbance activities is outlined in Table 7 (see section 4.2 for background information), with the associated KPI for Foundation 2 – Biodiversity conservation outlined in Table 8. These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose. With respect to State forest and timber reserves, these directions also support purposes of recreation and water catchment protection.

Table 7: Summary of management directions for managing permitted disturbance activities

Key points and considerations
<ul style="list-style-type: none"> Key permitted disturbances with potential impacts on biodiversity are resource development activities, infrastructure development and maintenance, work carried out on boundaries of prescribed burns and bushfires, and ecological thinning. Some activities, such as resource development activities, are not regulated under the CALM Act. The department's DAS enables assessment of planned disturbance activities on CALM Act lands, generally those regulated under the CALM Act, to avoid, minimise, manage and/or mitigate impacts on biodiversity and other values (such as ground and surface water). The Commission and the department provide proposal-specific advice as well as general guidance to externally regulated approval processes for resource development and infrastructure. The Commission and the department assist other agencies such as the Department of Mines, Industry Regulation and Safety with input to their oversight of current operations, development of rehabilitation requirements and completion criteria for hand-back of rehabilitated sites.

Management objectives	Management activities
1. Manage and minimise the impact of permitted disturbance activities, development and infrastructure projects on values of the planning area.	Provide advice and guidance material dealing with avoidance, reduction and mitigation of the impacts of disturbance activities, development and infrastructure on the values of the planning area.
	Provide advice and work with relevant agencies and industry proponents to establish agreed post-disturbance land use for areas within the planning area; develop agreed rehabilitation outcomes, objectives, standards and completion criteria for specified regions and ecosystems taking into account the need to ensure climate change resilience; and employ systematic monitoring to ensure agreed outcomes are met.
	Assess relevant proposed disturbance activity on CALM Act lands (other than externally regulated activities such as mining) using DAS to avoid or mitigate impacts on biodiversity and other values and assets.
	Report through periodic assessments on the total extent of CALM Act land disturbances, including areas disturbed in that period and areas remaining under rehabilitation.
	Following development where rehabilitation to the original land use is not considered feasible, pursue available alternative opportunities and the provision of compensatory additional land for reservation or other forms of compensation or offset.
	Continue to advise regulatory agencies and industry whether agreed rehabilitation completion criteria have been met prior to hand back so the land is able to be incorporated into the normal departmental management of the surrounding area.
	Maintain and enhance DAS capabilities to support and underpin impact assessment, decision-making and reporting.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 3: Mineral and petroleum exploration and development on lands vested in the Conservation and Parks Commission	
Corporate Policy Statement 4: Environmental offsets	

Table 8: Key performance indicator: Foundation 2

Representation and condition of forest ecosystems/biodiversity	
Strategic goal	To conserve biodiversity and support ecosystem resilience.
Performance measures	Management targets
Area of land protected in formal reserves.	An increase of at least 400,000 hectares in the area of lands that contribute to a CAR reserve system.
Trend of key biodiversity components as measured through a forest health monitoring program.	Status and condition of key biodiversity values is maintained or improved.

5.5 Foundation 3: Forest health and climate resilience

Strategic goal: To maintain or improve forest health and enhance climate resilience.

This plan adopts a combination of active and passive forest treatments intended to address the cumulative stressors on ecosystems. Foundation 3 includes a range of management programs and approaches that can protect and maintain biological diversity and ecological integrity of forest ecosystems, to maximise conservation outcomes, forest health and resilience. Programs and operations will be developed and implemented using a coordinated approach, such that management activities consider and address multiple pressures and threats. The plan intends for forest ecosystems to have adequate ecological integrity and self-sustaining characteristics to facilitate adaptive capacity in response to likely impacts from climate change.

Climate change is a well-recognised pressure on the values of the south-west forests and presents significant challenges for maintaining forest health. This plan specifically focuses on forest management in response to a changing climate. Climate action typically falls into one of two categories: climate mitigation, meaning actions to reduce emissions that cause climate change or enhance sinks of greenhouse gases to slow the rate of climate change; or climate adaptation, meaning actions to manage the actual or expected effects of climate change (IPCC 2022). This plan incorporates both climate mitigation and climate adaptation measures to manage the impacts of climate change within the planning area. Mitigation measures include enhanced carbon stores through an expanded reserve system (Foundation 2), protecting carbon-dense forest stores and promoting rapid recovery from disturbance. Adaptation measures focus on ecological thinning, assisted gene migration to improve adaptive capacity and increasing knowledge of climate science to guide adaptive practices.

Climate change has interactions with other threatening processes so active management includes practices such as reducing the impacts of pest animals, weeds and diseases and applying prescribed fire for bushfire mitigation. These approaches will build on, and integrate with, existing programs of the department for feral animal control, prescribed fire and biodiversity conservation and operate at the landscape or whole-of-forest scale. Where possible, management activities will consider and address multiple pressures and threats.

The scale and type of management activities taken to build ecosystem resilience are intended to influence long-term biodiversity conservation outcomes, just as global actions taken during the next 10 years will be critical to mitigate the level of climate change.

5.5.1 Climate mitigation: carbon storage

Maintaining or enhancing the total whole-of-forest level carbon store is an important element of the plan given the contribution of forests to the global carbon cycle. At the local or patch scale carbon will cycle between the various 'pools' (live and dead biomass; soil; atmosphere) at varying annual rates depending on weather-related growing conditions and natural disturbance events (such as bushfires, storms and disease outbreaks). In the longer term the carbon-carrying capacity of many areas is likely to reduce as progressively drier and warmer conditions lead to lowered site productivity. In addition, episodic drought and heatwave events may lead to forest structural changes in affected areas (Walden *et al.* 2019). Where trees are removed from an area by thinning, or vegetation is consumed by planned fire, the quantity of carbon removed and the time for retained or regenerating vegetation to restore (sequester) carbon on the site will vary with the relative intensity of the disturbance.

Consequently, at the whole-of-forest level the total carbon store may fluctuate annually in response to the extent and intensity of disturbances and the relative growth rates (and sequestration) across forest ecosystems. The cessation of large-scale commercial timber harvesting in State forests in the planning area; the application of silvicultural regimes for optimal growth (and sequestration) in the pine estate; the application of low-intensity prescribed burns to reduce bushfire impacts (particularly for protection of carbon-dense forests); and the promotion of healthy, biodiverse forest ecosystems are strategies in the plan that will contribute to maintaining the total carbon store.

Quantifying the variation in carbon storage and dynamics across forest ecosystems is an important step in refining the application of strategies to maintain the long-term stability of forest carbon stores. Research conducted across fire-tolerant eucalypt sites in the eastern states, for example, reported that carbon emissions at the patch scale from low-intensity prescribed burns were around 6 percent of the above-ground carbon store (Volkova and Weston 2015). Emissions at the patch scale from a high-intensity bushfire in jarrah forest in 2016 were a significantly higher proportion, but the accompanying tree mortality also converted 30-37 percent of the pre-fire carbon stored in live trees to the dead pool, which

has a much higher risk of subsequent loss if bushfires recur (Walden 2020). Strategies to manage the potential increase in frequency and intensity of bushfire events associated with climate change across the south-west include the maintenance of a rapid bushfire detection and response capability and implementation of the department's prescribed burning program.

Opportunities to increase native forest carbon stores within the planning area are currently limited to rehabilitation of disused tracks, degraded lands and other areas lacking vegetation. The costs associated with undertaking rehabilitation programs on such sites are currently prohibitive and will remain so until additional funding and resources are made available. Other opportunities to facilitate conservation outcomes through the generation of Australian Carbon Credit Units and increase forest carbon stores will continue to be explored during the life of the plan.

A summary of management directions for climate mitigation – carbon storage is outlined in Table 9, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.1 for background information). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose.

Table 9: Summary of management directions for climate mitigation – carbon storage

Key points and considerations	
<ul style="list-style-type: none"> Projected climate change is likely to create a long-term trend of diminished site productivity and hence carbon-carrying capacity of south-west forests. Carbon storage is influenced by factors such as forest growth rates, extent of clearing, extent of rehabilitation and extent and relative intensity of fire. Opportunities to improve conservation outcomes through carbon farming activities may become available during the life of this plan. 	
Management objectives	Management activities
1. Seek to maintain or enhance the long-term stability of the total forest carbon store in the plan area.	Prioritise the protection of carbon stored within carbon-dense forest ecosystems by managing the risk of landscape-scale high-intensity bushfires through prescribed burning and fire suppression. Identify carbon sequestration opportunities across the planning area.
2. Explore additional climate mitigation opportunities to reduce carbon emissions during the life of this plan.	Seek to promote recovery of carbon stores following disturbance events where appropriate, including through: <ul style="list-style-type: none"> regeneration following bushfire rehabilitation following other disturbance events or in degraded areas. Investigate carbon farming methodologies to identify emerging opportunities to enhance carbon storage on lands within the planning area. Contribute to national and state-level carbon accounting and reporting processes. Undertake data collection and analysis to support better accounting of forest management activities on the forest carbon cycle.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 19: Carbon farming on lands vested in the Conservation and Parks Commission Corporate Policy Statement 26: Climate action	

5.5.2 Climate adaptation: active forest management and ecological thinning

Large-scale studies in several headwater catchments across the northern and southern jarrah forests have demonstrated the effects of forest thinning in promoting groundwater recharge and streamflow (Bari and Ruprecht 2003; Kinal and Stoneman 2011, 2012; Ruprecht 2018), while many international studies have demonstrated that forest thinning can lead to medium to long-term reductions in the susceptibility of forest stands to droughts and heatwaves

(Sohn *et al.* 2016; Tague *et al.* 2019). As the water cycle is fundamental to ecosystem health and function, and hence the persistence of biodiversity, a key action under this plan to promote forest health and resilience to climate change will be to reduce chronic moisture stress by reducing the stocking density of vegetation (thinning) in targeted forest areas that are vulnerable to drying and warming conditions.

Native forests at risk of significant tree mortality often have substantial dense regrowth of woody vegetation and a pre-dominantly even-aged structure. While dense regrowth will naturally self-thin, the timeframe for this to occur can be decades.

Additional active management approaches will be required to maintain forest health and improve resilience of forests in a changing climate context. Active management includes those programs and practices detailed in Foundation 3.

An independent expert panel was engaged by the department to provide advice on the need and possible approaches to ecological thinning in the south-west forests. Their report (Burrows *et al.* 2022) provides valuable background information and, along with input from a range of consultation processes, has helped to frame the approach proposed in this plan. The approach has also been informed by the preliminary work undertaken by a combined agency, community and industry working group established in 2019 through the Djarlma Plan to implement the establishment of ecological thinning trials and demonstration areas.

Regrowth forests with a high number of trees per unit area (stocking density) are vulnerable to moisture stress and competition for other resources. Some forest stands have a high tree density due to past silvicultural treatments, bushfires, or rehabilitation practices after clearing. Thinning can allow the remaining trees to grow more quickly, accelerate the development of improved fauna habitat characteristics, store more carbon over time in large trees and improve their resilience to drought and bushfire events (Burrows *et al.* 2022 and references therein).

Ecological thinning

The primary objective of ecological thinning is to promote forest health and resilience in order to conserve biodiversity.

For the purposes of this plan, ‘ecological thinning’ will take place in ‘Forest Enhancement Areas’²¹ and involve the removal of a proportion of trees from an area to provide the retained trees and understorey with greater access to site resources (reduce competition) and improve resilience to environmental stressors, particularly water availability. Ecological thinning prescriptions or ‘regimes’ will therefore vary across forest ecosystems within the planning area. While DBCA will identify candidate areas and develop guidelines and prescriptions, the FPC will provide contract management, planning and operational support for ecological thinning for forest health. See Appendix 10 for further information on the process for the preparation of silvicultural guidelines for ecological thinning.

Where predominantly even-aged regrowth forests are thinned, a secondary objective may include progressively restoring some areas to a multi-aged structure that more closely resembles the likely condition of pre-European forests. Similar restoration forestry objectives are being pursued in many other forests around the world (O’Hara 2014).

Candidate areas

Under this plan, areas of vulnerable forest structure or condition within State forests and timber reserves will be considered for ecological thinning. While this will largely exclude areas within existing and proposed formal reserves and Disturbance Avoidance Zones, limited ecological thinning activity within such areas may be considered on a case-by- case basis by the Commission where there is a high likelihood that thinning would enhance conservation outcomes, such as the maintenance of habitat critical to threatened species or groundwater-dependent ecosystems. The Minister for Environment may approve ecological thinning activities in existing or proposed national parks, nature reserves, or Forest Conservation Areas, while the Commission may on a case-by-case basis endorse ecological thinning within Disturbance Avoidance Zones or other areas of State forest and timber reserves with a mixed forest structure. In these instances, the department will provide the Commission with an evaluation report on whether thinning is likely to maintain or improve environmental outcomes and the report will be made publicly available, before inclusion in an annual thinning program.

This approach recognises that the impacts of climate change will occur across tenures, and further knowledge on the location of vulnerable sites, and understanding of thinning benefits will accrue from adaptive management trials during the plan period.

Areas of densely stocked young regrowth forest (including some areas rehabilitated after disturbances such as mining)

²¹ Equivalent to ‘coupe’ for the purposes of the Forest Management Regulations 1993.

are considered particularly vulnerable to elevated levels of moisture stress over the period of this plan and are a priority for thinning (Ferguson *et al.* 2013; Burrows *et al.* 2022). Densely stocked stands in this context are those at or approaching full site occupancy and the degree of crowding (number of trees per unit area) is likely to give rise to tree mortality (generally the smaller trees) due to the onset of competition for moisture and other site resources. The thinning treatments will seek to reduce competition for moisture by selectively removing some of the trees. Because the understorey, ground flora and bare soil area also contribute to overall stand and catchment water balance, understorey management strategies will also be a consideration in adaptive management for climate change in south-west forests (Wardell-Johnston *et al.* 2015).

A focus on young regrowth stands reflects the comparatively higher water use of younger trees with large sapwood area relative to mature or old, senescent trees. As the maximum biological age of jarrah and karri trees can exceed 400 and 250 years respectively, ‘younger’ regrowth stands in this context are considered those regenerated since 1970 (younger than around 50 years of age in 2020). Within these stands areas suitable for ecological thinning will be informed by stand density management principles, landscape vulnerability to moisture stress, site characteristics and other factors including potential habitat for threatened species. For example, densely-stocked karri regrowth forest in areas projected to receive less than 900mm annual rainfall by 2030 (which is less than the historic limit of karri occurrence – see Maher *et al.* 2010) would be considered a priority for thinning.

Thinning is aiming to maintain forest health into an uncertain future. However, even thinned (and older) stands will continue to grow toward full site occupancy over time and at some point will again reach the limit of available resources, when varying degrees of stress will be alleviated by periodic mortality (Bradshaw 2015a, 2015b). The need and acceptability for any subsequent thinning activity will be informed by the status of stands, results of the trials and operations, and determined by forest health objectives, at the time.

Past regeneration and rehabilitation practices in the jarrah, karri and wandoo forests have given rise to several categories of forest that may benefit from thinning. Each of these categories is described below and their indicative location is depicted in Map 13.

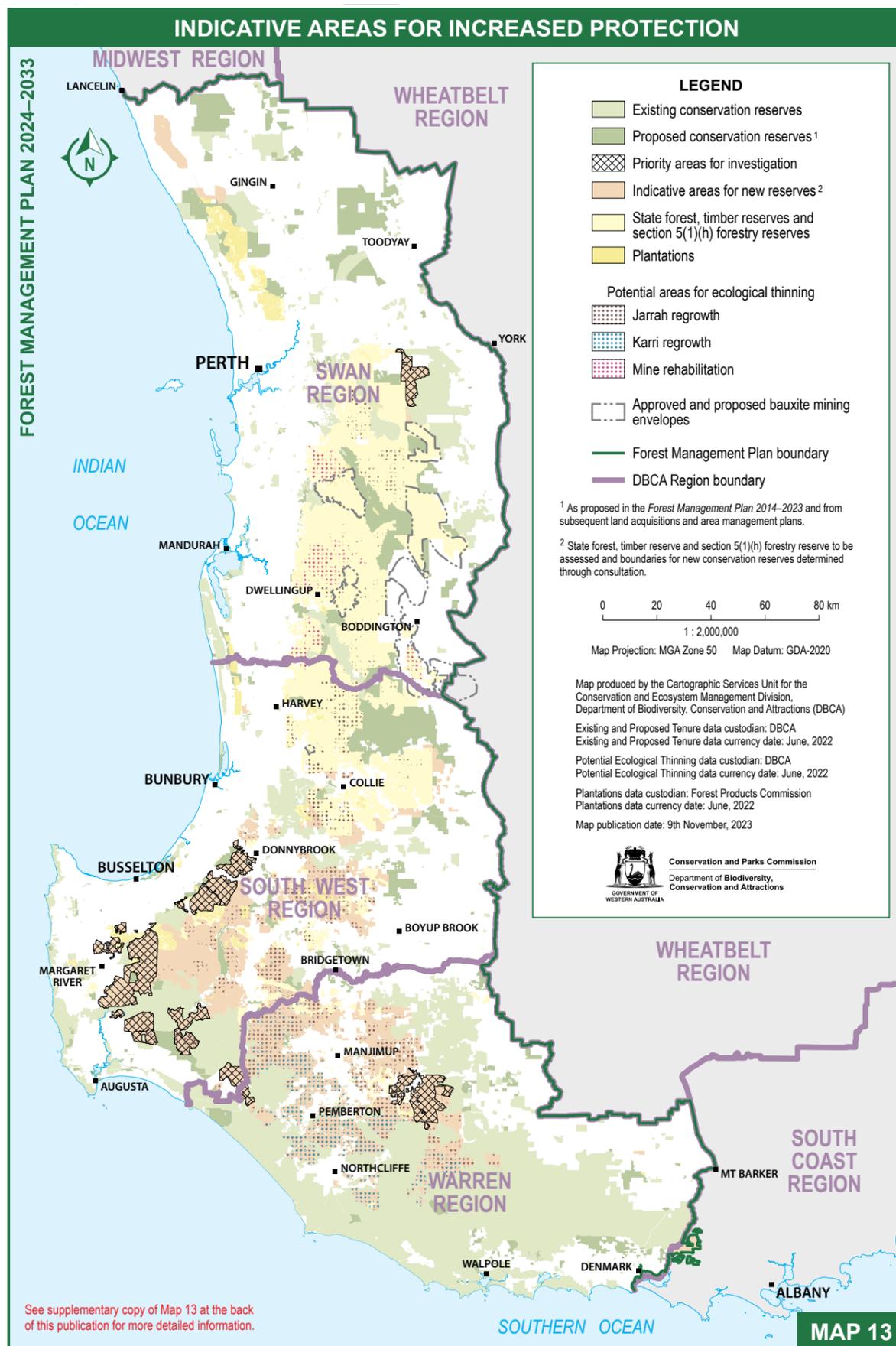


Mining rehabilitation

Ecological thinning could be applied to areas of State forest rehabilitated following mining operations, including bauxite mining within State Agreement Act leases. Aside from two areas near Jarrahdale, totalling 1,355 hectares (as at 2023), full management responsibility for these stands has yet to be returned to the State so collaboration with mining companies will be necessary to progress thinning proposals. Two broad categories of rehabilitation are identified – those areas dominated by older mixed plantings of mostly eastern states (exotic) eucalypts (which fulfilled rehabilitation requirements at the time), and areas rehabilitated with endemic species since 1988 which are dominated by seeded jarrah-marri.

Table 10: Areas of post-mining rehabilitated forest within age class at 2023

Dominant species	Area (hectares) of rehabilitated forest within age class at 2023					
	11-20 years	21-30 years	31- 40 years	41- 50 years	>50 years	Total
Exotic species	0	350	1,680	1,120	220	3,370
Jarrah - marri	Low priority	5,580	2,150	620	50	8,400



The areas of exotic species rehabilitated from 1966 to 1987 had highly variable growth rates and vary considerably in tree size, current stocking levels and site occupancy. Burrows *et al.* 2022 recommended these stands be converted to native forest species, if necessary, through repeated heavy thinning with supplemental planting of jarrah and marri. This conversion approach is consistent with an objective to re-establish self-sustaining native forest ecosystems, and the department will consider proposals which facilitate this outcome.

Rehabilitation standards for stands established by Alcoa Australia from 1988 to 2001 incorporated high initial stocking rates (averaging 3,000 trees per hectare at time of establishment) comprising a seed mix of 80:20 jarrah:marri. All of these stands have experienced varying degrees of natural mortality since establishment but are now at full site occupancy and trials have demonstrated positive effects from thinning on catchment water yield and tree growth without significant changes to understorey species composition or fauna use of areas (Norman *et al.* 2006; Grigg and Grant 2009; Craig *et al.* 2010). Stands older than 20 years have generally had at least one prescribed burn as part of larger integrated burns.

The initial stocking density of trees and understorey seeding rate were substantially reduced after 2001, partly in consideration of declining rainfall and the high water-use of densely stocked regrowth forests. The target and maximum allowable tree stocking density further reduced from 2016 and is not considered 'unnaturally dense'.

This plan proposes ecological thinning be undertaken in areas of densely stocked, older mining rehabilitation to promote stand health. Maximising the area thinned during this 10-year plan would address an escalating risk of significant stand mortality, thereby enhancing the overall resilience of the broader, structurally fragmented landscapes.

Jarrah regrowth

Stands of predominantly even-aged regrowth jarrah-marri are dispersed across forests previously cutover since 1970, with potential areas for ecological thinning depicted in Map 13. The patch size of regrowth areas varies from more than 100 hectares (older harvested areas) to less than 10 hectares (harvested since 1994), depending on the silvicultural prescription at the time of harvest, which aimed to achieve full stocking of regrowth trees. Timber inventory plots indicate tree growth rates have varied at sites across the planning area, impacted in some instances by disease, insect attack, bushfire and weather events. Apart from some small trials, these stands have not had their stocking density reduced by thinning, and the older stands are generally experiencing high levels of density-induced competition.

Table 11: Area of jarrah regrowth forest within age class at 2023

Location	Area (hectares) of regrowth forest within age class at 2023					Total
	11-20 years	21-30 years	31- 40 years	41- 50 years	>50 years	
North of Preston River	240	8,680	11,260	4,040	0	24,220
South of Preston River	Lower priority	21,560	31,960	8,600	0	62,120

This plan proposes ecological thinning be undertaken in areas of densely stocked, regrowth jarrah stands to promote forest health and resilience and support biodiversity conservation. Prioritisation of stands for thinning will initially involve consideration of their relative density (informed by stand density management principles and existing tree growth simulators that have been developed to investigate thinning responses). While thinning older regrowth stands will provide immediate benefits, Burrows *et al.* (2022) also recommended exploration of thinning practices to reduce stocking density in very young stands, in part to potentially reduce the accumulation of flammable fuels. Abbott and Loneragan (1986) demonstrated the benefits of thinning at very young ages on tree growth rates and it is proposed that adaptive trials be implemented in targeted areas to monitor effects on hydrological benefits to wetter parts of the landscape.

Karri regrowth

Table 12: Area of karri regrowth forest within age class at 2023

Thinning status	Area (hectares) of regrowth forest within age class at 2023					Total
	11-20 years	21-30 years	31-40 years	41-50 years	>50 years	
Unthinned	6,880	13,180	6,630	2,110	1,930	30,730
Thinned	0	110	3,440	8,060	5,170	16,780

Thinning in advance of significant tree mortality provides the opportunity to enhance resilience given the uncertain manner in which climate change may manifest across forest ecosystems. There are significant additional conservation benefits that could be achieved at the landscape scale from thinning densely stocked young regrowth karri stands beyond maintaining the water balance of riparian habitat and vegetation communities. These are discussed in Burrows *et al.* (2022) and include the faster progression to areas dominated by larger trees with greater resilience to bushfires and a higher proportion of mature tree habitat characteristics. The opportunity to create heterogeneity (diversity) of stand structure through variable-density thinning will also be important because there are currently large expanses of densely stocked, uniform even-aged karri forest in these landscapes. Vertical and horizontal complexity in vegetation structure, including clumping of trees at the patch scale, are important habitat characteristics for many fauna species (Bain 2016).

This plan proposes ecological thinning be undertaken in areas of densely stocked regrowth karri to promote forest health and resilience and support biodiversity conservation.

Wandoo

Table 13: Area of wandoo regrowth forest within age class at 2023

Dominant species	Area (hectares) of regrowth forest within age class at 2023					Total
	11-20 years	21-30 years	31-40 years	41-50 years	>50 years	
Wandoo	120	30	10	0	0	160

Given the woodland structure and regeneration characteristics of wandoo only very small patches of even-aged regrowth have been mapped that could be considered for ecological thinning. While the department does not envisage any substantial thinning activity would be a priority, circumstances or new knowledge may emerge that indicate thinning in wandoo areas would promote positive conservation outcomes. This may be most appropriate where community, traditional owners or other groups seek to partner with the department in targeted local projects.

Other vulnerable areas

Many densely stocked regrowth forests are located within a mosaic of forest structures at the catchment and landscape scales. Improved water balances may require thinning beyond the regrowth patches, to ensure hydrological benefits to wetter parts of the landscape, and this may encompass other forest structures. In such instances the same principles of thinning the younger smaller trees with retention of all mature and legacy habitat elements will apply, but further work is required to inform strategies. Burrows *et al.* (2022) recommended, and this plan proposes, a series of operational trials be established within an adaptive management framework to explore approaches relative to ongoing climate change.

The operational-scale thinning trials will apply a broader range of treatments and intensities than historic stand-level trials, to better inform the landscape-scale ecological consequences of treatments. For example, this may include measuring the impact on hydrological values and vegetation, of varying the spatial pattern and number of retained trees with increasing distance from riparian features.

Overall scale and timing of ecological thinning operations

Recognising the imperative to undertake climate adaptation measures from the commencement of this FMP, ecological thinning in even-aged regrowth jarrah, karri and mining rehabilitation areas will proceed initially through the development of silvicultural guidelines that will be refined or adjusted over time informed by monitoring and research programs (see Appendix 10).

The total area of thinning undertaken in any forest category during the 10-year period of the plan will depend on several factors. A key driver will be the preferred rate at which improved forest health and resilience at the stand and landscape scales is sought. Other determinants will include the level of resourcing made available to undertake these activities, the technical feasibility and availability of suitable equipment to undertake the new thinning, and consultation outcomes during development of thinning plans. The area thinned annually may also fluctuate as the status and condition of suitable areas are progressively refined. In jarrah forest seasonal access restrictions to protect forest health from the introduction or spread of *Phytophthora* dieback will also influence the operation of programs.

The department will initiate an expert review of ecological thinning silvicultural guidelines during the second half of the term of this plan to inform adaptive management processes.

Tables 10 to 13 list the area within age classes for the regrowth forest and rehabilitation categories and provide an indication of the potential scale of ecological thinning activity during the plan period. Depending on site, practical management boundaries and other factors listed above, not all the area within an age class would necessarily be a priority for thinning. Any operational trials at a catchment scale (around 400-500 hectares each) or other emerging vulnerable areas would also contribute to the total area thinned. The relative contribution to an annual thinning program of each forest category may vary over time. A goal of reducing moisture stress and promoting forest health at the patch level across all categories within the plan period would likely require an overall annual thinning program up to 8,000 hectares. The Minister for Environment may approve additional areas where ecological thinning can be undertaken to improve forest health (for example, thinning treatment of other vulnerable areas outlined above).

Annual ecological thinning plans will be published which identify the location and criteria used to identify candidate areas, including consideration of how planned thinning will maintain or improve biological diversity, ecological integrity, forest health and the quality of land, soils and water.

Traditional owners via Noongar regional corporations, relevant Government entities and other stakeholders will be consulted on the plans at various stages and the outcomes incorporated in the plan. Information will be provided on how management has or will be adapting following the implementation of previous ecological thinning plans.

Essential components of ecological thinning

Managing the potential for trees to resprout following felling or prescribed fire to reduce the fuel loads generated, are also essential components of an ecological thinning regime.

The hydrological benefits of reducing stocking density in regrowth stands can be short-lived if vigorous resprouting (coppicing) from stumps occurs. Approved herbicides can be applied to prevent resprouting, and this will probably comprise part of the operations in regrowth jarrah and mining rehabilitation stands. Where areas have high biodiversity or other values at risk but are highly sensitive to ground disturbance the department will consider notching or ring-barking and retention of dead standing trees to reduce moisture stress. These instances are likely to be limited and need consideration of bushfire and prescribed burning implications.

Recent studies in mixed-conifer forests of similar Mediterranean climate highlight the importance of integrating fire regimes with stocking density management to promote resilience in frequent-fire environments (North *et al.* 2022). Integrated planning of ecological thinning within broader landscape scale programs for prescribed fire and predator control will therefore be necessary to maximise forest health and biodiversity outcomes.

Potential co-benefits to improving forest health by ecological thinning

In line with the principles of ESFM, ecological thinning regimes can be tailored with varying emphasis to meet multiple objectives alongside thinning to improve forest health. Improved visual amenity by reducing uniformity of structure and stocking density, as well as potential improvement in the distribution of fuel loads within the landscape, can be co-benefits of ecological thinning. Where salvage²² and removal of forest products is considered acceptable, socio-economic benefits can accrue through the provision of direct and indirect employment, downstream processing, and potentially climate mitigation, depending on the longevity of end use of the forest products. The sale of forest products that result from ecological thinning may enable costs of thinning to be offset, enabling a larger area to be treated and hence improve patch and landscape resilience.

A summary of management directions for climate adaptation – ecological thinning is outlined in Table 14, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.1 for background information). Where these activities apply to State forest and timber reserves, the primary objective is conservation. These activities may also support purposes of recreation, water catchment protection and other purposes prescribed by Regulation 81 of the CALM Regulations. If considered for other land categories the activities are also to be consistent with the objective of conservation.

²² For the purposes of the FMP, 'salvage' from State forest and timber reserves involves the recovery of forest products from trees that have been felled (such as in thinning activities), damaged (such as from significant natural disturbances) or other activity (such as road construction).

Table 14: Summary of management directions for climate adaptation – ecological thinning

Key points and considerations	
<ul style="list-style-type: none"> Ecological thinning involves the removal of trees from an area to reduce competition among retained trees and understorey for moisture and other resources. Ecological thinning activities will be undertaken to promote forest health and resilience, including to the impacts of climate change, in order to conserve biodiversity. Areas of densely stocked young regrowth forest are considered particularly vulnerable to elevated levels of moisture stress and are a priority for thinning. Thinning is proposed for mining rehabilitation areas, and regrowth jarrah, karri and wandoo forest categories. Ecological thinning prescriptions will vary across forest ecosystems to achieve improved forest health and climate resilience. Ecological thinning regimes can be tailored to meet multiple objectives including improved visual amenity, improvement in the distribution of fuel loads within the landscape and, where salvage and removal of forest products is considered acceptable, socio-economic benefits can accrue. No more than 8,000 hectares will be thinned each year in State forest and timber reserves; this includes areas for operational trials. 	
Management objectives	Management activities
1. Undertake ecological thinning activities in densely stocked regrowth forests and other vulnerable landscapes to promote forest health and resilience in order to conserve biodiversity.	Develop and implement silvicultural, soil and water, and fire management guidelines for the application of ecological thinning regimes to manage outcomes for stocking density, structural heterogeneity, fuel management and biodiversity values.
	Adopt an adaptive management approach to ecological thinning trials informed by research findings, exploring a range of thinning prescriptions to enhance ecological values and progressively refine guidelines as results become available.
	Maintain strategic forest inventories and undertake modelling to inform adaptive measures at the patch, local and landscape scales.
	DBCA will identify candidate areas for ecological thinning and prepare publicly available annual plans depicting the thinning program of up to 8,000 hectares.
	Undertake research into use of ecological thinning as an adaptation strategy to minimise impacts of climate change.
	Assess through DAS and implement approved proposals to undertake ecological thinning in mining rehabilitation, regrowth jarrah, regrowth karri or regrowth wandoo forests. Consult affected mining companies prior to thinning in areas where they retain a management responsibility.
	Evaluate landscape vulnerability using risk assessment principles to inform application of ecological thinning through a combination of remote sensing, mapping of site characteristics, field assessment and modelling
Make available forest products from ecological thinning operations in State forests and timber reserves for salvage, removal and sale by the FPC.	

Management objectives	Management activities
	The FPC will provide operations and contract management support for ecological thinning in State forests and timber reserves, and inform the area planning processes in cases where forest products could be salvaged and removed.
	Prepare evaluation reports for the Commission's endorsement for ecological thinning proposals in Disturbance Avoidance Zones, conservation reserves and proposed conservation reserves.
	Undertake an independent review of ecological thinning, informed by research, monitoring and management effectiveness evaluations, to inform periodic assessments.
	Publish initial and future iterations of ecological thinning silvicultural guidelines on the DBCA website as soon as practicable once finalised.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 20: Responding to climate change in the context of lands and waters vested in the Conservation and Parks Commission Corporate Policy Statement 26: Climate action	

5.5.3 Climate science

The effectiveness of the plan is dependent largely on the knowledge that informs management directions and actions. Science aims to provide the knowledge for informed decision-making on climate mitigation and adaptation.

A summary of management directions for climate science is outlined in Table 15, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.1 for background information). These management directions are designed to meet general functions of the department.

Table 15: Summary of management directions for climate science

Key points and considerations	
<ul style="list-style-type: none"> Management will be informed by understanding how climate change, and associated feedbacks, affects forest health and interacts with other pressures. Information gathered through monitoring and research will inform adaptive management in relation to climate change. 	
Management objectives	Management activities
1. Increase knowledge and understanding of climate change trends, interactions, feedbacks, impacts, and responses to inform an adaptive approach to management.	Monitor the trends in climate, the impacts on key values in the planning area, and the response of forest vegetation cover to climate variability and natural events.
	Build capacity and undertake research into impacts of climate change on species persistence in forest areas and trial adaptation strategies such as assisted gene migration.
	Incorporate the latest climate science and down-scaled climate projections for the south-west forests in biodiversity conservation planning, ecological thinning trials and operations, prescribed fire planning, rehabilitation after disturbances and plantation management.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 20: Responding to climate change in the context of lands and waters vested in the Conservation and Parks Commission Corporate Policy Statement 28: Science	

5.5.4 Fire management

The department has a legislated responsibility under the CALM Act to prevent, manage and control fire on lands to which the Act applies. Fire regimes that are sympathetic to the ecological requirements of forest ecosystems are essential for their effective functioning. Fire can assist in the regeneration of native vegetation and promote the germination of seed, the maintenance or modification of habitats, and release and cycling of nutrients. Fire has a role in a range of other ecosystem processes, including hydrology, and in the management of certain weeds, pests and diseases. Fire regimes that are characterised by an appropriate range and diversity of fire intensities, seasonality, frequency (burn intervals) and spatial heterogeneity will promote ecosystem health and vitality, thereby providing greater resilience to climate change. Fire regimes must also accommodate requirements for bushfire risk mitigation and facilitate the provision and protection of various values, such as water and forest produce.

The department’s fire management and prescribed burning program aims to manage biodiversity at a range of spatial scales and is informed by landscape, regional and local requirements. Burning mainly occurs over autumn and spring. In the wettest forests, prescribed burning is also undertaken in summer under safe conditions. These burns are mostly low or moderate intensity, and often include many unburnt patches. Prescribed burn planning typically intends to avoid some parts of the planning area, such as wetlands, riparian vegetation, and rocky outcrops. Since 1990, the mean return fire interval in the south-west forests has averaged around 10-18 years.

This fire management approach is underpinned by legislation and supported by research and more than 60 years of operational evidence. Fire science and operational evidence have demonstrated that forests that contain high fuel loads burn more intensely, the fire has a longer residence time and is more dangerous and difficult to suppress. It may also cause spot fires far ahead of the main fire front.

Large bushfires that develop away from urban or settled areas can spread rapidly towards urban areas, and if they are burning in long-unburnt vegetation, they can be difficult or impossible to control. Managing fuels in the broader landscape away from private property helps mitigate the impacts of bushfires on infrastructure corridors of economic and public safety significance (such as powerlines and highways), biodiversity, recreational, water catchment and other values. It is therefore critical to manage fuel build-up both near private property and in the broader landscape.

The department has a framework and process for planning, implementing and reviewing its prescribed burning program that is aligned with the international standard for risk management – ISO 31000. This considers biogeography, land use, community protection and other factors, such as the available resources.

Each planned burn has management objectives, burn strategies and success criteria. The burn program aims to:

- protect the key values of the planning area, including fire-sensitive ecosystems
- consider any other relevant management objectives in areas subject to planned burning
- seek to address the risk presented by bushfire on CALM Act lands and the risk associated with movement into surrounding tenure
- seek to manage carbon emissions and avoid major emissions from catastrophic bushfires
- support biodiversity and facilitate spatial and temporal habitat diversity, and
- integrate weed and pest management activities for areas pre- and post-burn and post-bushfire suppression.

Burn program development facilitates this by applying a consistent process to prepare three-year and annual Burn Options Programs that reflect the objectives and priorities set out in Regional Fuel Management Plans. This process is undertaken annually to ensure a three-year plan is always available to support long-term planning and the scheduling of preparatory work. The annual Burn Options Program enables detailed planning and burn implementation work to be undertaken. Individual prescribed fire plans are then developed for each planned burn (Figure 2). Knowledge and experience acquired through the process contributes to adaptive management (such as adjustment of burn timing and pattern in a warmer and drier climate) and continuous improvement. DBCA is currently developing an improved electronic prescribed burning planning system that will provide the ability for a more detailed and transparent process of reporting outcomes internally and externally against planned burn objectives.

Input from the stakeholder and community engagement during the development of this plan called for more consultation with Aboriginal people, particularly in relation to fire and cultural burning practices.

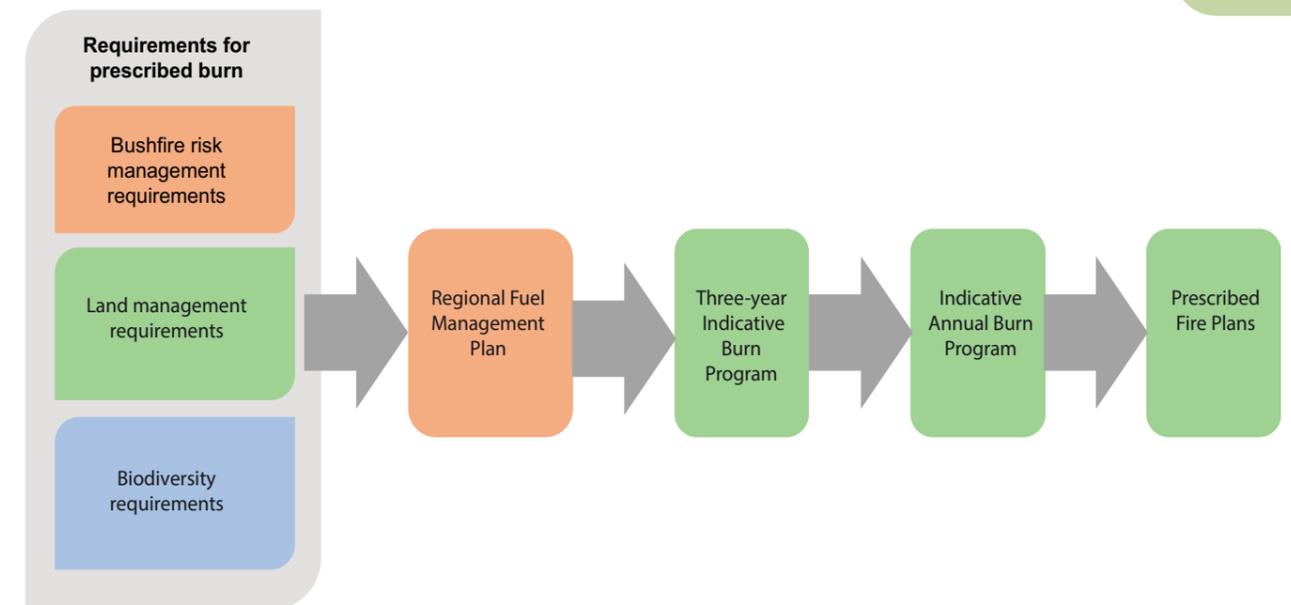


Figure 2: Broad outline of the approach to planning the department’s prescribed burning program

DBCA is committed to working with traditional owners through management partnerships in helping to share (two-way learning), maintain, connect and where possible rebuild Aboriginal people’s connection to country, including gaining knowledge of cultural fire practices and how these principles can assist in guiding the use of fire in the context of today’s landscapes.

Prescribed burning is generally applied under mild conditions to establish a range of different fuel ages across the landscape. Variations in fire interval together with seasonality, intensity, scale, and patchiness of burning are important components of contemporary fire management practices that assist in ensuring the best possible outcomes for our communities, the environment and for biodiversity. These principles are consistent with those of cultural burning. Contemporary planned burning strategies also need to consider assets within and adjoining burn areas including communities, industry, agriculture and infrastructure.

DBCA is the lead agency to implement the Enhanced Prescribed Burning Program as an action in the Western Australian Climate Policy. The program aims to reduce the frequency and size of bushfires in the forests in the planning area to protect the community and the environment from the impacts of bushfire (DWER 2020).

A summary of management directions for fire management is outlined in Table 16, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.3 for background information). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose. These directions may also support purposes of recreation and water catchment protection.

Table 16: Summary of management directions for fire management

Key points and considerations
<ul style="list-style-type: none"> • Prescribed burning in the planning area is conducted in accordance with legislative responsibility, State Government policy and DBCA corporate policies and operational procedures and standards. • The protection of life (people and communities) is the primary consideration when planning and implementing fire management activities, with biodiversity conservation and other land management considerations also an integral part of this process. • Fire is an important component of forest health and for ecosystem functioning, including regeneration and nutrient cycling. Species have a range of mechanisms to persist through fire or recolonise after burning. • Reducing fuel build-up reduces the intensity of large-scale bushfires, which impact on biodiversity and forest health. • The risk of bushfire is expected to increase in a warming and drying climate over the next decade. An adaptive approach is required to planning and implementing prescribed burns to continue to mitigate this risk. • Fire management practices are closely linked to climate mitigation and adaptation activities.

Table 16 continued: Summary of management directions for fire management

Key points and considerations	
<ul style="list-style-type: none"> The department is committed to working with Noongar Traditional Owners through a partnership approach to better understand, share and incorporate cultural fire knowledge. DBCA aims to maintain at least 45% of DBCA managed land in the planning area at a fuel age of less than six years since last treatment with the intent this is predominantly achieved through prescribed burning rather than bushfire. This equates to achieving on average approximately 200,000 hectares of prescribed burning in the south-west annually. 	
Management objectives	Management activities
1. Manage fire in the planning area to protect life, communities and assets from the impacts of bushfire.	Maintain capability in fire management, including prescribed fire, bushfire risk mitigation, detection and suppression.
	Undertake annual prescribed burning program in a manner that considers land management and biodiversity requirements within a risk management framework.
2. Use and respond to fire to promote the maintenance and improvement of forest health, the conservation of biodiversity and mitigate the risk of adverse impacts of bushfire in the planning area.	Undertake bushfire suppression with regard to the department's fire management policies, guidelines and operating procedures.
	Engage with stakeholders and the community on the planning and implementation of prescribed burning to develop understanding of, support for and collaboration in, fire management efforts.
	Undertake research into fire behaviour and fire ecology to inform management effectiveness and forest health.
	Undertake monitoring of fire impacts and outcomes from prescribed burning to inform fire response and use of planned fire in management of forest health and biodiversity values.
	Develop an electronic prescribed burning planning system to facilitate improved setting of prescribed burn objectives and provide for a more detailed and transparent process of reporting burn outcomes utilising tools such as burn severity mapping outputs.
	Apply an adaptive management approach to the implementation of the prescribed burning program to ensure continual improvement in achieving multiple program objectives for prescribed fire.
	Ensure that the community continues to be provided with appropriate and timely information and advice on the department's Annual Burn Options Program and day-to-day prescribed burning operations.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 1: Prescribed burning on vested lands Corporate Policy Statement 19: Fire management Corporate Policy Statement 88: Prescribed burning	

5.5.5 Weeds

For most weed species, control or eradication is expensive. Preventing their introduction and spread is a more cost-effective option. Effective ecosystem-based management of weeds relies on suitable surveillance systems and implementation of biosecurity hygiene measures within and between sites in the planning area and beyond to mitigate weed threats. There is also the need to focus on rehabilitation and regeneration to increase resilience to threats, including changing climate. Strategic investment in potential new technologies supporting next-generation biological control – for instance, biocontrol for arum lily – will be an important tool in effective, cross-tenure integrated weed management within and beyond the planning area (Sheppard and Glaznig 2021; Scott *et al.* 2014).

The department has responsibilities under the *Biosecurity and Agriculture Management Act 2007* with regard to declared pests and seeks to achieve weed management objectives within its available resources, working in partnership with the Department of Primary Industries and Regional Development (DPIRD) and other stakeholders where relevant.

The management goals for priority weed species include localised eradication, density reduction and containment, based on the biodiversity assets being threatened and the size and density of the weed population. In the period 2014 to 2021, there was a focus on responding to infestations of weeds in areas of higher conservation value and implementing subsequent monitoring. A similar approach will also be required for weeds threatening priority areas and values for the term of this plan. Following disturbance activities including fire, weed management may need to be undertaken to ensure the ecological values of the area are maintained.

A summary of management directions for weeds is outlined in Table 17, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.4 for background information). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose.

Table 17: Summary of management directions for weeds

Key points and considerations	
<ul style="list-style-type: none"> Sixty-seven high-priority weed species have been identified in the planning area. Competition from weeds affects many threatened flora and ecological communities, particularly those restricted to small, disturbed areas. The suite of weed species will probably change in a warming climate, with some species becoming more invasive. Management responses are based on the values being impacted and the size and density of the weed population. 	
Management objectives	Management activities
1. Minimise the impact of existing and emerging priority weeds on forest health in the planning area, including from plantations.	Maintain and support weed prioritisation processes, including eradication where possible, surveillance, monitoring, and recording management activities and effectiveness.
	Promote appropriate notification of weed species and prescribed actions.
	Encourage the coordinated involvement of government, industry, the community, and other land managers in addressing priority weeds, including facilitating knowledge transfer, awareness raising, management and capacity building.
	Undertake research to improve weed identification, knowledge of weed impacts, invasiveness and management to enhance effectiveness.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 14: Weeds management	

5.5.6 Pest animals

Western Shield is the largest conservation program in Australia, focused on managing introduced predators, namely foxes and feral cats, that impact native fauna. The program delivers fox and feral cat management to more than 85 percent of the planning area. The primary management tools are toxic baits containing the naturally occurring poison sodium fluoroacetate (1080), found in native plants of the genus *Gastrolobium* or ‘poison peas’, to which native animals have developed a tolerance.

Feral cat and fox activity often increases following disturbances such as vegetation clearing, bushfire and prescribed burns, and additional baiting is proposed following disturbance activities when specific values are at risk. A monitoring framework across 21 sites has been developed under the program, including broadscale monitoring of fauna populations to progressively refine the frequency and season of baiting, as well as the relative effectiveness of control efforts.

Western Shield will continue to be a key approach for biodiversity conservation and maintaining and improving forest health over the next 10 years. The department will also seek to identify new and or innovative approaches to managing foxes and feral cats.

Feral pigs are distributed across the majority of the forest ecosystems within the planning area although densities vary. Given that feral pigs are contained within six genetically defined populations, the potential for effective management and localised eradication is feasible. The department will continue to undertake and deliver feral pig control activities with increased effort in areas of high conservation value.

Feral deer are considered an emerging problem. Due to their cryptic nature feral deer are difficult to manage, however populations in the south-west forests are currently small and localised and with effort could be effectively controlled or eradicated.

A summary of management directions for pest animals is outlined in Table 18, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.5.1 for background information). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose.

Table 18: Summary of management directions for pest animals

Key points and considerations	
<ul style="list-style-type: none"> Foxes and feral cats are the most significant pest animals in the planning area due to their impact on native fauna. Fox and cat activity often increases following disturbances. The <i>Western Shield</i> program delivers fox and feral cat management to 85 percent of the planning area and will continue to be a key approach for biodiversity conservation and maintaining and improving forest health. Feral pigs are distributed across the planning area, however densities vary. Pigs have multiple impacts, particularly in wetter areas. As feral deer, goat and horse populations are currently small and localised, the opportunity exists to control or eradicate them from the planning area. Endemic insect pests that impact forest trees include jarrah leaf miner and gum leaf skeletoniser. Several exotic invertebrate pests represent ongoing biosecurity threats to native forests and plantations. 	
Management objectives	Management activities
1. Minimise and reduce the risk of introduction, spread and impact of pest animal species on ecosystems, including from plantations.	Maintain, adapt and improve the <i>Western Shield</i> fauna recovery program, including implementation of the <i>Western Shield</i> monitoring plan across the planning area. Optimise the frequency of fox baiting across the area baited within the planning area and integrate feral cat baiting in suitable areas to reduce predation pressure. Consider supplemental fox and feral cat baiting requirements when approving disturbance activities through DAS and following landscape-scale bushfires.

	Apply and support management efforts to control feral pigs, deer, goats, horses and other pest animals particularly to protect priority habitat and key conservation values.
	Encourage the coordinated involvement of government, industry, the community, and other land managers in addressing priority pest animals, including facilitating knowledge transfer, awareness raising, surveillance, monitoring, incursion management and capacity building.
	Undertake research into pest animal (vertebrate and invertebrate) management to enhance management effectiveness and identify novel strategies.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 12: Pest animal management	
Corporate Guideline 39: Use of dogs for feral pig control activities on CALM Act land	



Feral cat and fox activity often increases following disturbances such as vegetation clearing, bushfire and prescribed burns, and additional baiting is proposed following disturbance activities when specific values are at risk.

Feral cat with native ballawara prey captured on remote camera – DBCA

5.5.7 Diseases

To date, disease management in the planning area has focused on minimising the spread of *Phytophthora* dieback into uninfected areas. This remains an important objective given the severe negative impacts of the pathogen *P. cinnamomi* on biodiversity and forest health, and the known high risk of spreading the disease through disturbance activities (particularly in moist-to-wet soil conditions). Mapping the occurrence of dieback on CALM Act lands, implementing hygiene protocols, training and public education are key to managing dieback and other diseases.

Dieback mapping is a resource-intensive activity supported by field-based sampling, and there is potential to increase its effectiveness with innovative techniques. Existing and emerging technologies for controlling the spread and impact of dieback should also be considered over the term of this plan. Major technological breakthroughs for consideration include aerial phosphite treatment of infested communities to protect key susceptible threatened flora and ecological communities, use of metham sodium treated gravel where dieback-free material is needed for road construction and maintenance, and integrated methods for containment and eradication where a new infestation is highly localised.

Other diseases such as marri canker and myrtle rust also pose a risk to south-west forests and may require increasing management.

A summary of management directions for diseases is outlined in Table 19, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.6 for background information). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose.

Table 19: Summary of management directions for diseases

Key points and considerations	
<ul style="list-style-type: none"> • <i>Phytophthora</i> dieback is the most significant plant disease affecting values in the planning area, with many native flora and threatened species considered susceptible. Of CALM Act lands vested in the Commission intensively mapped to date, 28 percent (248,700 hectares) is infested. • Despite a drying climate, conditions in the planning area will remain favourable for <i>P. cinnamomi</i> and could potentially increase dieback expression and impacts. • Management of <i>Phytophthora</i> dieback has primarily focused on minimising the spread into uninfected areas through training in dieback awareness and use of appropriate hygiene. This will continue to be an important approach, together with new techniques and technologies. • New and emerging diseases are also a threat to the values of the planning area. 	
Management objectives	Management activities
<ol style="list-style-type: none"> 1. Minimise the impact of plant disease and associated tree declines on the values of the planning area. 2. Minimise the risk of introduction of exotic plant disease and protect those areas currently free from disease symptoms. 	Maintain a <i>Phytophthora</i> dieback mapping program by retaining capacity, high standards of interpretation, and laboratory-based diagnostic capability which meet management requirements.
	Apply tactical procedures and operational controls for <i>Phytophthora</i> dieback, including through use of emerging technologies such as metham sodium treatment of basic raw materials (BRM), and through monitoring the efficacy of longstanding procedures and controls.
	Develop and implement management guidelines and processes to allow for sterilised BRM, including that from other land tenures, to be used in areas with at-risk biodiversity values.
	Monitor the long-term impacts of <i>Phytophthora</i> dieback and other priority plant diseases on forest health, including the impact of a drying climate to inform future management decisions.
	Work cooperatively with relevant agencies and land managers to identify, prepare for, and respond to plant biosecurity threats (for example, myrtle rust), enabling a swift response.
	Undertake research into improving disease identification and detection, knowledge of disease impacts and management methodologies to enhance management effectiveness.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 7: The threat of <i>Phytophthora</i> dieback to biodiversity values on lands vested in the Conservation and Parks Commission of Western Australia Corporate Policy Statement 3: Management of <i>Phytophthora</i> dieback	

5.5.8 Soil and water

The conservation of soil and water is closely linked to the conservation of biodiversity, Noongar cultural heritage, and to sustaining the ecological capacity and health of forest ecosystems.

Forest disturbance activities such as mining and other approved activities can be detrimental to soil and water resources if not properly managed. The extent of the impact from these operations can be minimised using appropriate management techniques, such as protecting and maintaining waterways and their foreshore areas, protecting and maintaining wetlands and their buffers, contamination identification and management, and minimising soil compaction.

Vehicle impacts on the physical characteristics of soil are immediate, generally obvious and often decrease soil fertility. Principles and tactics developed during the previous FMP to protect soils and manage surface water during timber harvesting and roading activities, such as maximising the use of previously disturbed areas or favouring access under dry soil conditions, will be applied to ecological thinning operations. The risk of increasing stream salinity from rising groundwater following thinning has diminished further with significant increases in depth to groundwater. However, measures in place during the previous FMP will continue to apply and be reviewed should ecological thinning be proposed in 'salt sensitive' or 'high salt risk' areas of forest.

As noted in Part B, the management of the land and permitted disturbance activities in the planning area have important consequences for water resources, including their biodiversity, physical condition and ecological health, water quality, water supply and public health, and a range of legislation, policies and guidelines apply.

DWER has a key role with respect to water resource protection and management, including allocation planning, protecting PDWSAs and assessment of waterway health, hydrology and hydrogeology. Policies and procedures in the planning area are also implemented by the Water Corporation, which has delegated responsibility in PDWSAs under the relevant legislation.

Within the planning area, waterways and their foreshore areas and wetlands and their buffers play an important role in the conservation of biodiversity, forest health and ecological function. To help protect water quality, biodiversity and the physical condition and ecological function of water resources, the use of certain products, practices or activities may be limited or controlled in some areas (for example, in PDWSAs or near waterways and wetlands). Additional safeguards minimise the risk of clearing riparian or wetland vegetation, harm to the physical condition and ecological function of water resources, sediment movement, turbidity and contamination of water bodies.



Lake C.Y. O'Connor and Mundaring Weir, Beelu National Park, Mundaring - DBCA

DWER and the Department of Health have best practice management guidance for pesticide use in PDWSAs and the type and levels of recreational activities that are permitted may also be restricted. DBCA will work collaboratively with other agencies, land managers and proponents to identify, plan, manage and monitor activities that may be detrimental to soil and water resources.

A summary of management directions for soil and water is outlined in Table 20, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.9 for background information on soil degradation). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose. As these directions primarily apply to State forest and timber reserves, they may also support purposes of recreation and water catchment protection.

Table 20: Summary of management directions for soil and water

Key points and considerations	
<ul style="list-style-type: none"> Soil and water are important components of forest health in the planning area. Managing access and disturbance activities is important to minimise detrimental impacts to soil and water resources. A range of Acts, policies and subsidiary documents apply to protecting and maintaining soil and water resources. The department works cooperatively with other relevant agencies, land managers and proponents to identify, plan for, manage and monitor activities that may be detrimental to soil and water resources. DWER and the Water Corporation also have responsibilities and processes relevant to the planning area. Any activities that may activate acid sulphate soils, contaminated sites or have potential to increase salinity are identified in DAS. 	
Management objectives	Management activities
1. Maintain the quality of land, soils and water in the planning area.	Ensure activities undertaken in the planning area do not have significant negative impacts on soils and the quality and quantity of groundwater and surface water.
2. Minimise and manage the risk of adverse impacts of soil disturbance from activities undertaken in the planning area.	Review and maintain subsidiary guidelines, procedures, training programs and reporting mechanisms to minimise and address disturbance of soil and water values.
	Develop or contribute to the provision of guidance and training for staff and proponents of disturbance activities in the management of soils and water.
3. Protect soil and water quality and the physical condition and ecological health of water resources in the forested catchments of the planning area.	Undertake research into trends in quantity and quality of surface and groundwater levels and assess the impact of management on the water-related ecological values and water supply.
	Undertake research into soil health, soil biodiversity, and monitor impacts from management activities that lead to soil disturbance, as well as recovery and restoration of soil health post disturbance.
4. Protect water supplies, including the quality and flow of water to surface water reservoirs and groundwater recharge areas in PDWSAs.	
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 11: The protection of surface and groundwater biodiversity values of lands vested in the Conservation and Parks Commission of Western Australia Corporate Policy Statement 40: Road management	

5.5.9 Regeneration and rehabilitation

Regeneration and rehabilitation of native vegetation cleared during both permitted and unplanned disturbances is undertaken to restore and maintain a wide range of biodiversity, cultural and social values.

Regardless of the type of disturbance, regeneration can be achieved where landforms and soil profiles are appropriately returned, and rehabilitation undertaken using endemic species. While there are practical and logistical challenges in meeting the demand for seed collection and plant propagation services, sourcing seed for rehabilitation can generally be undertaken at a regional scale to maximise genetic diversity and adaptive capacity as most widespread and common species show low genetic structure and broad provenance. The identification of adaptive variation associated with

climate gradients in jarrah and marri suggests that a climate-adjusted provenancing approach that sources seed from drier areas can be considered as a climate adaptation strategy for these dominant tree species (Ahrens *et al.* 2019; Filipe *et al.* 2022). Where disease is present it may be appropriate to consider the use of disease-resistant genotypes if available.

Where disturbances occur, the objective should be to minimise impacts, and for regeneration and rehabilitation to restore capacity for the area to be resilient and self-sustaining and, after time, provide for a diverse range of environmental and social values. This objective similarly applies to regeneration of historically disturbed areas where rehabilitation was either not required or not undertaken.

The south-west forests have experienced a range of patch-level clearing disturbances where rehabilitation may be incomplete or deferred. A process to systematically identify, assess and prioritise areas will facilitate rehabilitation when opportunities arise. Rehabilitation generally aims to restore pre-clearing ecosystem composition and function, however, in practice that may not be achievable. In those cases, such sites may be able to provide particular outcomes (for example, enhanced water supply) with appropriate design and management intervention. This planning will be done in collaboration with other relevant agencies or land managers.

Restoration following natural disturbance events

Natural disturbance events such as bushfire, drought, pest and disease outbreaks can impact forests at a range of scales, from small patch to landscape scale, and at varying intensities. Small-scale or localised low-impact occurrences are generally considered part of natural forest ecosystem dynamics. Occasionally, large-scale events result in extensive tree mortality and forest structural change such as occurred in the high-intensity bushfires near Northcliffe in 2015 and Waroona in 2016. Forest restoration plans incorporating strategies for regenerating overstorey composition, restoring biodiversity values and promoting forest health can assist forest recovery. Such plans may be developed as needed, building on strategies and processes implemented during the previous FMP.

Rehabilitation following cessation of plantation activities

Within State forests there are areas where plantations have been felled and left fallow pending opportunities to re-establish native vegetation. The Gngangara-Moore River State Forest includes 17,500 ha of ex-plantation area. Consistent with the Gngangara groundwater allocation plan (DWER 2022a) opportunities are being pursued to replant these areas to native vegetation, to provide environmental and social benefits, including food resources for ngoolyak, while ensuring ongoing management is balanced with the primary objective of maximising groundwater recharge.

Rehabilitation following permitted disturbance

Rehabilitation of native forest cleared during permitted disturbance operations such as resource development activities, quarrying, BRM extraction or establishment of (now redundant) roads, tracks and landings is undertaken to restore a wide range of forest values over time. Rehabilitation must be carefully planned and implemented to ensure the affected areas are resilient to natural and anthropogenic changes including those associated with climate change.

While commercial timber harvesting will cease by the end of 2023, silvicultural treatments will need to continue in a selection of coupes until regeneration is satisfactorily achieved.

There are circumstances where permitted disturbance activities and methods (for example, open cut mining) mean it is not practical or economically feasible to rehabilitate the post-mining landform to its original condition. In such cases, it is important that the post-disturbance outcomes and land use are identified and agreed at the development assessment stage and both rehabilitation objectives and completion criteria are developed that are specific, measurable, achievable, relevant and timebound.

A summary of management directions for regeneration and rehabilitation is outlined in Table 21, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.8 for background information). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose. As these directions primarily apply to State forest and timber reserves, they may also support purposes of recreation and water catchment protection.

Table 21: Summary of management directions for regeneration and rehabilitation

Key points and considerations	
<ul style="list-style-type: none"> Regeneration and rehabilitation may be required following permitted, unplanned and historical disturbances. Rehabilitation of areas affected by permitted disturbance activities is a formal requirement under legislation and several State Agreement Acts, or other statutory approvals. Requirements for rehabilitation and 'completion' are set in the disturbance approval process (also refer to 5.4.3). Rehabilitation should aim to restore appropriate ecological values and achieve resilient self-sustaining ecosystems taking into account climate change and other threatening processes. Adherence to best-practice principles and approaches when sourcing seed increases the success of restoration and rehabilitation efforts. Achieving pre-clearing species composition and ecosystem function is often difficult. It may not be feasible to restore some disturbed areas of forest. 	
Management objectives	Management activities
<ol style="list-style-type: none"> Develop and maintain self-sustaining ecosystems of native species following disturbance activities in the planning area, where practicable and appropriate. Seek to improve biological diversity and ecological integrity with respect to forest health in degraded ecosystems and rehabilitated areas. 	Continue silvicultural and post-harvest regeneration activities for areas harvested under FMP 2014-2023.
	Establish a program to identify candidate sites for regeneration/rehabilitation of historically disturbed areas.
	Develop and implement restoration project plans as necessary for areas significantly disturbed by natural events.
	Develop and implement a guideline for best practice regeneration/rehabilitation of FMP areas post disturbance.
	Undertake research to develop best practice approaches to restoration and regeneration for disturbed areas.
	Maintain expertise and capacity (including seed collections) to undertake regeneration.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 3: Mineral and petroleum exploration and development on lands vested in the Conservation and Parks Commission	

5.5.10 Unauthorised activities

DBCA is responsible for implementing regulatory compliance with the CALM Act and BC Act. Authorised officers undertake enforcement duties in accordance with DBCA's Corporate Policy Statement 38 - Compliance and Enforcement. The application of enforcement standards includes guidance materials to ensure best practice application of law enforcement and support staff in the exercise of compliance and enforcement responsibilities. Enforcement responses are subject to regional risk assessments and consistency achieved through the development of local compliance plans to ensure there is sufficient flexibility to meet emerging issues.

A summary of management directions for unauthorised activities is outlined in Table 22, with the associated KPI for Foundation 3 – Forest health and climate resilience outlined in Table 23 (see section 4.7 for background information). These management directions apply to all land categories the subject of this plan, with a primary objective of contributing to a conservation purpose. As these directions primarily apply to State forest and timber reserves, they may also support purposes of recreation and water catchment protection.

Table 22: Summary of management directions for unauthorised activities

Key points and considerations	
<ul style="list-style-type: none"> Unauthorised activities can harm the environment, impact cultural sites and detract from visitors' enjoyment of the forest. Unauthorised activities are more prevalent closer to major population centres; there is widespread public concern over their impacts. Education and targeted information on legal alternatives are key strategies to reduce the prevalence of some unauthorised activities. There may be a need to identify additional designated areas for off-road vehicle users and/or promote the use of established off-road vehicle areas. Enforcement responses are subject to case-by-case regional risk assessments and available resources. Illegal firewood collection is expected to remain challenging to manage for a range of reasons. 	
Management objectives	Management activities
<ol style="list-style-type: none"> Manage unauthorised activities to reduce adverse impacts on the values of the planning area. Promote appropriate behaviour in the planning area through education, visitor interpretation and environmental stewardship. 	Continue to implement a compliance and enforcement framework and explore opportunities to work cooperatively with other agencies and land managers (for example, DWER and Water Corporation).
	Seek to enhance compliance capacity to respond to high-impact and/or high-risk unauthorised activities, such as illegal firewood collection, illegal hunting and unsanctioned trails.
	Endeavour to develop and implement a behaviour change program, incorporating messaging for unauthorised activities.
	Develop recreational guidelines for clubs and other recreational forest users.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 38: Compliance and enforcement Corporate Guideline 38: Enforcement options	

Table 23: Key performance indicator for Foundation 3

Condition of indicators of forest health affected by management in the planning area	
Strategic goal	To maintain or improve forest health and enhance climate resilience.
Performance measures	Management targets
The spatial extent and changes in the condition of forest ecosystems.	Maintenance or improvement of the condition, biological diversity and ecological integrity of forest ecosystems in the planning area through management activities.
Trend of key forest health indicators measured through forest health monitoring program.	Maintenance or improvement of key forest health indicators in the planning area through management activities.

5.6 Foundation 4: Social and economic benefits and opportunities

Strategic goal: To deliver social, cultural and economic benefits through the provision of goods and services.

Socio-economic issues are an important consideration in ESFM. The planning area provides various goods and services that provide a range of social, cultural and economic benefits for the community. In terms of revenue and direct and indirect employment, the most significant industries relate to forest-based resources and recreation and tourism sectors. Native timber available from salvage from forest management activities that improve forest health or from approved mine clearing, will also provide socio-economic benefits.

Foundation 4 focuses on forest-based resources, recreation and tourism, other Australian heritage, access, certain BRM and leases and licences. Stakeholders and the community have an important role in the management of the planning area and stakeholder and community engagement is included in this section.

5.6.1 Nature-based tourism and recreation

The planning area provides important opportunities to meet the growing public demand for outdoor recreation and nature-based tourism in the south-west. It supports and provides opportunities for outdoor recreation for approximately 80 percent of the population of Western Australia and also receives the most visits to parks and reserves in the state. People are more likely to appreciate and understand the values of the south-west forests when they have opportunities to visit and experience them through recreation and tourism activities. The benefits of nature for physical and mental wellbeing are increasingly understood and documented, so providing for visitors has both social and economic value to the community.

The recreation and tourism industries also make valuable contributions to regional economies, both directly and indirectly. Partnerships with local government authorities (LGAs), other government agencies and the tourism industry are important in the planning, funding, delivery and governance of recreational facilities and experiences.

The visual qualities and landscapes of the planning area, as well as the full range of other biodiversity, cultural and heritage values present, must be considered when planning new infrastructure, promoting increased public access and changing land use. To do this it is necessary to identify the landscape types and features requiring special attention, and to develop and implement appropriate management and planning policies that contribute to their maintenance and enhancement.

The *Control of Vehicles (Off-road Areas) Act 1978* provides for areas where the use of off-road vehicles is permitted and prohibits their use in certain places. It further provides requirements for the registration of off-road vehicles. Permitted areas under this Act for registered off-road vehicles and also for licensed on-road vehicles, have previously been established in State forest and timber reserves and on CALM Act section 5(1)(g) and (h) reserves consistent with Corporate Guideline 32. Road licensed four-wheel drive vehicles and motorcycles currently have legal access to existing

public forest roads and tracks in the planning areas except where such access is legally restricted, such as in forest Disease Risk Areas. Further off-road vehicle areas and designated trails for road licensed four-wheel drive vehicles and motorcycles may need to be identified to meet the demand for recreation and tourism and to counter unauthorised use. Any proposed trails and off-road vehicle areas require careful assessment due to impacts from noise, dust and requirements to manage trail creep outside of designated areas, in addition to minimising potential environmental and cultural impacts. In addition to providing areas to operate off-road vehicles, a range of other actions are required to effectively manage the potential impacts. Actions include: liability and risk management; planning for trails and sustainability of off-road vehicle areas; education and enforcement/compliance; registration and licensing;



Valley of the Giants Tree Top Walk, Walpole-Nornalup National Park - Tourism Western Australia

and sustainable funding models. Careful design and active daily management of off-road vehicle areas is necessary to address safety risks and limit environmental impacts.

A summary of management directions for nature-based tourism and recreation is outlined in Table 24, with the associated KPI for Foundation 4 – Social and economic benefits and opportunities outlined in Table 30 (see section 3.6.2 for background information). These management directions apply across land categories the subject of this plan, although with limited application to nature reserves. These directions have a primary objective of contributing to a recreation purpose.

Table 24: Summary of management directions for nature-based tourism and recreation

Key points and considerations	
<ul style="list-style-type: none"> The planning area contains many areas of perceived natural beauty that provide opportunities for nature-based tourism and recreation. Annual visits to the planning area have increased by more than 40 percent in the last 10 years, to 12.65 million visitors in 2020-21. The south-west forests are expected to remain an important destination for recreation and tourism as they provide for around 80 percent of the state's population. Outdoor recreation contributes to public understanding and appreciation of nature, conservation and forest management, as well as providing physical and mental health benefits for the community. There is a need to balance the provision of enjoyable and enriching visitor experiences with the protection and conservation of other values and uses. Visitor planning is a key tool to ensure public access is well considered, does not impact other values and addresses overcrowding or overtourism. 	
Management objectives	Management activities
<ol style="list-style-type: none"> Provide for a range of recreation and nature-based tourism opportunities, through visitor planning that seeks to minimise impacts on other values and uses and delivers economic benefits to meet public demand. 	Plan for and provide a range of quality recreation and nature-based tourism facilities and services in suitable locations, including through commercial concessions.
	Assess recreation and tourism proposals to ensure that approved activities enhance, or do not negatively impact on, the area's key values, visitor experiences and sense of place.
<ol style="list-style-type: none"> Seek to enrich visitor experiences and promote environmental stewardship, by providing opportunities to learn, explore and interact with the natural and cultural environment. 	Monitor visitor use and satisfaction to inform planning, operations, and commercial opportunities.
	Manage and maintain recreation sites to maintain visitor satisfaction and manage visitor risk.
	Collaborate across government and the community to plan for strategic investments in visitor infrastructure development to create new and improved visitor experiences.
	Encourage and support opportunities for Aboriginal cultural tourism including events, tours and recreation businesses that create jobs for Aboriginal people and enrich experiences for visitors.
	Support environmental stewardship and appropriate visitor behaviour by providing a suite of educational information in the form of interpretive signage, education programs, ranger talks, media and publications.
	Encourage and facilitate access to the planning area by people of all abilities and culturally diverse backgrounds.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 18: Recreation, tourism and visitor services	
Corporate Guideline 32: Recreation, tourism and visitor services	

5.6.2 Other Australian heritage

The State Register of Heritage Places is a statutory list of places that represent the story of Western Australia’s history and development and is created by the *Heritage Act 2018*. Heritage lists can also be recorded by local government under the *Planning and Development Act 2005* and local planning schemes.

A summary of management directions for historic heritage is outlined in Table 25, with the associated KPI for Foundation 4 – Social and economic benefits and opportunities outlined in Table 30 (see section 3.5 for background information). These management directions apply across national and conservation parks and nature reserves to preserve sites of historic interest. These may also be applied where historic sites occur on other land categories in the planning area, where not inconsistent with their purpose.

Table 25: Summary of management directions for other Australian heritage

Key points and considerations	
<ul style="list-style-type: none"> The timber industry has been an important part of the history of early settlement and development in the south-west region. There is a wide range of historic places in the planning area, some of which are listed on the State Register of Heritage Places. 	
Management objectives	Management activities
1. Identify and manage other Australian heritage values in the planning area.	Promote awareness and understanding of the importance of protecting heritage places. Seek to ensure that departmental systems contain records of the presence and type of heritage places.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Guideline 32: Recreation, tourism and visitor services	

5.6.3 Forest-based resources

Forest-based resources include native forest and plantation timber, firewood, craftwood and burls, honey (from beekeeping), wildflowers and seeds. Water may be stored and taken where it is in the public interest and BRM can be taken for public purposes.

Native forests

Circumstances under which forest products may be salvaged and removed from State forests or timber reserves under FPC production contracts include areas being cleared for mining, or public and DBCA-related infrastructure, ecological thinning operations, natural disturbance events giving rise to landscape restoration activities, and the maintenance or construction of DBCA forest roads, firebreaks and fire access tracks. Native timber sourced from these activities will continue to be available for products including high-value furniture, joinery and artisanal products. ‘Forest products’ do not include fallen timber made available for public collection in public firewood areas, which is dealt with below.

Plantations

Plantations of pines and eucalypt species have been established within the area covered by the plan for the purpose of supplying wood products to industry. State Agreement Acts have been enacted to attract large-scale investment in processing of pine logs. Harvesting operations are conducted in accordance with a range of subsidiary documents and any specific site-level approval conditions.

Production from plantations may be affected by:

- Climate change: it is expected that the long-term productive capacity of south-west forest ecosystems (and plantations) will continue to be affected by drier and warmer conditions.

- Degradation: for example, with an increase in bushfire frequency, intensity and scale, and prolonged droughts, it is possible that more plantations will be affected. Plantations often will not recover from bushfire.
- Mining operations: for example, through large-scale mining to extract basic raw materials such as sand and limestone.
- Other long-term social and economic demands: for example, areas of ex-plantation in Gnangara-Moore River State Forest managed to increase groundwater recharge.

A summary of management directions for plantations is outlined in Table 26, with the associated KPI for Foundation 4 – Social and economic benefits and opportunities outlined in Table 30 (see section 3.6.1 for background information). These management directions apply to State forest and timber reserves and are to meet the purpose of optimising yield to meet supply obligations.

Through the management activities outlined in Table 26, this plan seeks to sustain the productive capacity of plantations as they progressively adapt to changing climate conditions.

Table 26: Summary of management directions for plantations

Key points and considerations	
<ul style="list-style-type: none"> The FPC has responsibility for the implementation of on-ground management activities relating to plantations. Plantations will continue to be managed to achieve optimal production yields. Climate change and predicted increase in bushfire may affect production for plantations. Tenure for plantations will remain as State forest or timber reserve. The plantation estate can play a key role in carbon sequestration, local land remediation and provide long-term renewable resources. 	
Management objectives	Management activities
1. Manage plantations for: <ul style="list-style-type: none"> wood products and ecosystem values community benefits industry for the future. 	Seek to maintain the area of plantation estate by replanting pines in all suitable areas of State forest and timber reserves that have previously been planted with pines and have been clearfelled, except where not consistent with government policy. In the Gnangara-Moore River State Forest, optimum yield having been achieved, remaining standing pine will be retained and subject to silviculture treatments to enhance food resources for ngoolyak. Consider biodiversity plantings for management of ground water recharge. Manage the silviculture and harvesting of forest products from plantations to optimise yield to meet supply obligations. FPC will manage individual operations on State forests and timber reserves through the DAS. Where not inconsistent with meeting supply obligations, manage plantations to take account of recreation use and seek to minimise adverse impacts on this and other values when undertaking silvicultural operations and harvesting. Incorporate into plantation management the latest climate science and down-scaled climate projections for the south-west. Develop a Memorandum of Understanding between DBCA and FPC to address respective roles and funding arrangements for plantation fire protection, weed management and other operational activities.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 11: Regulation of the forest products industry Corporate Policy Statement 19: Fire management	

Public Firewood Areas

Public Firewood Areas provide a mechanism for the department to specify where already fallen timber can be taken as firewood by the public from State forest and timber reserves. Before access to the public is permitted, firewood areas are subject to a thorough site assessment of resource availability, impact on the water catchment, risk of spreading diseases such as *Phytophthora* dieback, impacts on threatened fauna and flora, and impacts on recreational and cultural heritage values. Access to public firewood areas is based on members of the public adhering to provisions of the Forest Management Regulations to reduce the environmental impact of collecting firewood.

Under this plan it is proposed that public firewood areas be made available from:

- areas that have been subject to ecological thinning, and areas where activities necessary to maintain and restore forest health have been carried out
- areas outside of reservoir protection zones
- areas that have been recently harvested in the term of FMP 2014-2023, and
- areas that were historical (pre-FMP 2014-2023) harvest coupes and where the removal of firewood would not be incompatible with a conservation purpose.

To address the environmental impacts of unauthorised firewood collection, the department will consider enforcement strategies and behaviour change initiatives, with the aim of reducing unauthorised firewood collection. Measures to improve public awareness and encourage voluntary compliance through communication and education campaigns will also be pursued.

Apiculture and related products

The department administers an apiary site authority system that allows apiarists to access CALM Act land and certain other Crown lands, such as unallocated Crown land for the purpose of beekeeping activities. DBCA policy and guidelines provide guidance on assessing the suitability and management of apiary sites. Some activities required for the establishment of apiary sites also require approval under the EP Act. Approved sites are managed under conditions, including those that address management of impacts from apiary.

Wildflowers and seeds

The management of the native flora industry in Western Australia is undertaken by the department through the provisions of the BC Act, using a system of licensing, area and species-specific management and monitoring to help ensure the conservation of flora being harvested. Within the planning area the take of wildflowers for commercial purposes is limited to State forest and timber reserves.

Basic raw materials (BRM)

State forest and timber reserves contain supplies of gravel, shale, clay, sand, limestone and rock that are known as BRM. There is an ongoing need for these materials from the department, Main Roads Western Australia (Main Roads), the FPC and local government. The State Gravel Strategy developed by Main Roads assesses the State's BRM requirements.

The assessment of proposals and the establishment of BRM extraction pits is governed and enabled by separate pieces of legislation including the CALM Act, *Main Roads Act 1930*, *Land Administration Act 1997*, EP Act and Mining Act.

Proposals by Main Roads to extract BRM on land to which the plan applies will require an agreement with the department that governs the requirements for pit approvals, establishment, management and costs.

Proposals by local government to extract BRM on land to which the plan applies will require a licence issued by the department that governs the requirements for pit approvals, establishment, management and costs. Approval for BRM extraction will also be assessed against the [Local Government Guidelines for Road Gravel Supplies in Western Australia](#)²³.

Proposals by companies to extract BRM on land to which the plan applies will require Mining Act tenure as well as the Minister for Mines and Petroleum's consent for mining under section 24 of the Mining Act. In the case of State forests and certain other CALM Act reserves, this consent also requires the agreement of the Minister for Environment as the Minister responsible for the land.

Water storage and take

The main State legislation that governs water resource management is the *Rights in Water and Irrigation Act 1914* (RIWI Act), which is administered by DWER. DBCA provides input and advice into water allocation planning and licensing processes associated with the taking of water from land vested in the Commission.

The CALM Act allows for the department to issue a licence for water storage and take where the proposal meets the requirements of the CALM Act. State forest and timber reserves may be used for the storage and taking of water (dam sites), associated infrastructure, and other similar facilities, that serve the public interest, to the extent to which locating such infrastructure and facilities would not be inconsistent with achieving the other purposes for which the area is reserved.

In a drying climate, there may be increased demand for the storage and removal of water from the planning area for commercial or public purposes, which must be balanced with the value of these water resources in sustaining aquatic ecosystems.

A summary of management directions for forest-based resources (excluding plantations) is outlined in Table 27, with the associated KPI for Foundation 4 – Social and economic benefits and opportunities outlined in Table 30 (see section 3.6.1 for background information). These management directions apply primarily to State forest and timber reserves and meet purposes prescribed by Regulation 81 of the CALM Regulations and may also support the purpose of recreation. These activities are also consistent with the functions of the department under the CALM and BC Acts.

²³ walga.asn.au/getattachment/Policy-Advice-and-Advocacy/Infrastructure/Roads/Gravel-supplies-for-Public-Roadworks-v4-July-2021.pdf

Table 27: Summary of management directions for forest-based resources (excluding plantations)

Key points and considerations	
<ul style="list-style-type: none"> Forest-based resources includes 'forest products' as defined in the FP Act (which includes trees and timber) BRM, water, firewood, apiary products, wildflowers and seeds. Apiculture is a significant and growing industry in Western Australia. Within the planning area, apiary sites are assigned and managed using apiary site authorisations. BRM such as sand, clay, rock and gravel are used in the building and construction industries and for management purposes in the planning area. Extraction and assessment of proposals is managed by various Acts. Proposals for the storage and take of water from State forest and timber reserves are assessed by the department. 	
Management objectives	Management activities
1. Removal of forest products from indigenous State forests and timber reserves is consistent with the purposes described in Regulation 81(e) of the CALM Regulations.	<p>Liaise with beekeepers, the Bee Industry Council of Western Australia, and DPIRD to provide for the efficient and sustainable use of apiary sites and support improved swarm control techniques.</p> <p>Regulate the supply of other forest produce through the administration of relevant licensing frameworks.</p> <p>Identify suitable locations within State forest and timber reserves for the gazettal of public firewood areas and refine conditions to improve sustainability of collection.</p>
2. Facilitate use of CALM Act land for apiary activities to a sustainable level.	<p>Prepare and implement a Public Firewood Management Strategy to address behaviour change on firewood collection methods.</p>
3. Allow for the availability of BRM while managing the impacts of extraction and use of BRM.	<p>Monitor wildflower and seed collection supply patterns to inform understanding of sustainability and implement appropriate management responses as required.</p>
4. Assess proposals in a consistent manner for the storage and take of water and installation of associated infrastructure.	<p>Seek to ensure that all BRM removals:</p> <ul style="list-style-type: none"> comply with relevant legislation, policies and guidelines are in the interests of the public contribute to the ongoing implementation of relevant government strategies, including the State Gravel Supply Strategy are sourced from a network of strategic pits where possible, to be identified in consultation with relevant agencies and BRM users.
5. Manage the removal of other forest-based resources (not referred to above) in a manner which satisfies public demand, so far as is practicable, sustainable and consistent with the CALM Act.	<p>Contribute to the establishment and maintenance of a database to capture the location, condition, use and other criteria of BRM sites.</p> <p>Other than for legacy leases and licences, continue to assess proposals for storage and take of water which are in the interests of the public, where the proposal can be accommodated without unacceptably impacting on values of the planning area and/or delivers a positive management outcome.</p>
Relevant Commission position statements and DBCA policies and guidelines	
<p>Position Statement 12: Basic raw materials</p> <p>Corporate Policy Statement 37: Management of wildlife utilisation</p> <p>Corporate Policy Statement 41: Beekeeping on Crown Land</p> <p>Corporate Guideline 21: Beekeeping on Crown Land</p>	

5.6.4 Access

Roads and bridges

A well-designed and managed system of roads and bridges is essential to connect towns and communities and provides:

- access for neighbours and visitors to enjoy recreational opportunities
- easements for utilities such as water, gas, electricity and communications
- access for management purposes, including to facilitate rapid response to bushfires and other emergencies, and
- access for ongoing commercial activities.

The road network in the planning area, including many culverts and bridges, is extensive and expensive to maintain. A reduction in timber harvesting will result in a reduction in road maintenance programs undertaken by that sector.

Bridges on the strategic road network intersect with permanent and seasonal waterways and often provide access to water source points. In undertaking its normal operations of fire protection and replacing bridges in accordance with the CALM Act, the department will need to disturb the beds and banks of waterways to provide for strategic water and a road network for public safety. Interference with a watercourse may require authorisation and a permit issued under section 17 or section 25 of the RIWI Act.

Leases and licences

Leases and licences for access to and use of the land to which the plan applies have been granted for uses including communication towers, utilities infrastructure, grazing to reduce fuel loads, water storage, and for recreation and tourism facilities. This includes cafes, caravan parks and other accommodation, as well as activities such as tours and other commercial recreation activities (including organised events and filming).

The department may enter into a lease or licence where they meet the requirements of the CALM Act and are compatible with the purposes for which the land is reserved under the CALM Act and the relevant management plan. Leases and licences may have conditions attached that provide a regulatory basis for managing and monitoring permitted activities.

Land use changes

Situations may arise where the department is requested to excise State forest or other CALM Act land to facilitate approved public infrastructure and/or other land use changes.

A summary of management directions for access is outlined in Table 28, with the associated KPI for Foundation 4 – Social and economic benefits and opportunities outlined in Table 30. These management directions apply across land categories, with a primary purpose of recreation. On State forest and timber reserves these directions may also support recreation, and other purposes prescribed by Regulation 81 of the CALM Regulations.

Table 28: Summary of management directions for access

Key points and considerations	
<ul style="list-style-type: none"> A strategic access network is important for a range of purposes, including public access, management, maintenance of public utilities and provision of recreational services (including commercial activities). Leases and licences are granted for appropriate facilities and uses to provide socio-economic benefits while managing environmental impacts and considering the value of land to culture and heritage of Aboriginal persons. Amendments to tenure, including excision of land to which the plan applies, may be required to meet land use planning commitments, for the provision of services, or to rationalise and upgrade road networks. 	
Management objectives	Management activities
1. Maintain a safe and adequate access network for management purposes and to provide for social and economic benefits and opportunities.	Prioritise maintenance and upgrade of selected departmental roads to preserve strategic access. Establish new bridges and replace existing bridges on the department's road network as required. Maintain and establish new water points as required to provide for effective fire response and public safety.
2. Enable access to and uses of land that are compatible with the purposes for which the land is reserved.	Assess applications for leases and licences to occupy or access and use land, taking into account impacts on values of the land, other users and public benefit.
3. Facilitate the excision of land to which the plan applies which is required for approved alternative land uses.	Where approved through planning and environmental approval processes, facilitate the excision of land under the provisions of the CALM Act.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 18: Recreation, tourism and visitor services Corporate Policy Statement 40: Road management Corporate Policy Statement 55: Commercial filming Corporate Policy Statement 68: Management of events and group activities Corporate Guideline 13: Guidelines for the management of events and organised group activities Corporate Guideline 20: Commercial filming Corporate Guideline 32: Recreation, tourism and visitor services	

5.6.5 Stakeholder and community engagement

Stakeholder and community involvement is an integral part of the department's operations, and the contributions made by volunteers are highly valued. The department values public participation and recognises the need to continue to consider, in a meaningful way, the knowledge and opinions of others as part of its decision-making process. Volunteers expand the department's work capabilities, knowledge and skills base and are valuable to the department because they build communication links and understanding between the department and the community. Public participation, volunteering and stakeholder engagement is formalised under relevant policies and guidelines.

During the development of this plan, the department undertook broad-ranging consultation with stakeholders and the public to understand their views, priorities and aspirations relating to the health and management of the south-west forests. Consultation identified that stakeholders and the public have a genuine desire to contribute to biodiversity conservation and forest management beyond the planning phase, and as part of the implementation of the plan.

Analysis of feedback from stakeholders and the public informed the development of this plan. Detailed reports are available on the [DBCA website](http://www.dbca.wa.gov.au)²⁴. Stakeholder and community engagement emerged as a dominant theme. This theme can be broken down into five sub-themes:

1. Engagement with Noongar Traditional Owners and incorporation of kadidjiny (covered in Foundation 1).
2. Greater and ongoing public participation in development and implementation of forest management approaches.
3. Education on forest management practices and sustainable forest use.
4. Improved two-way communication with stakeholder and user groups.
5. Collaboration with university and student research and data collection, and citizen science programs.

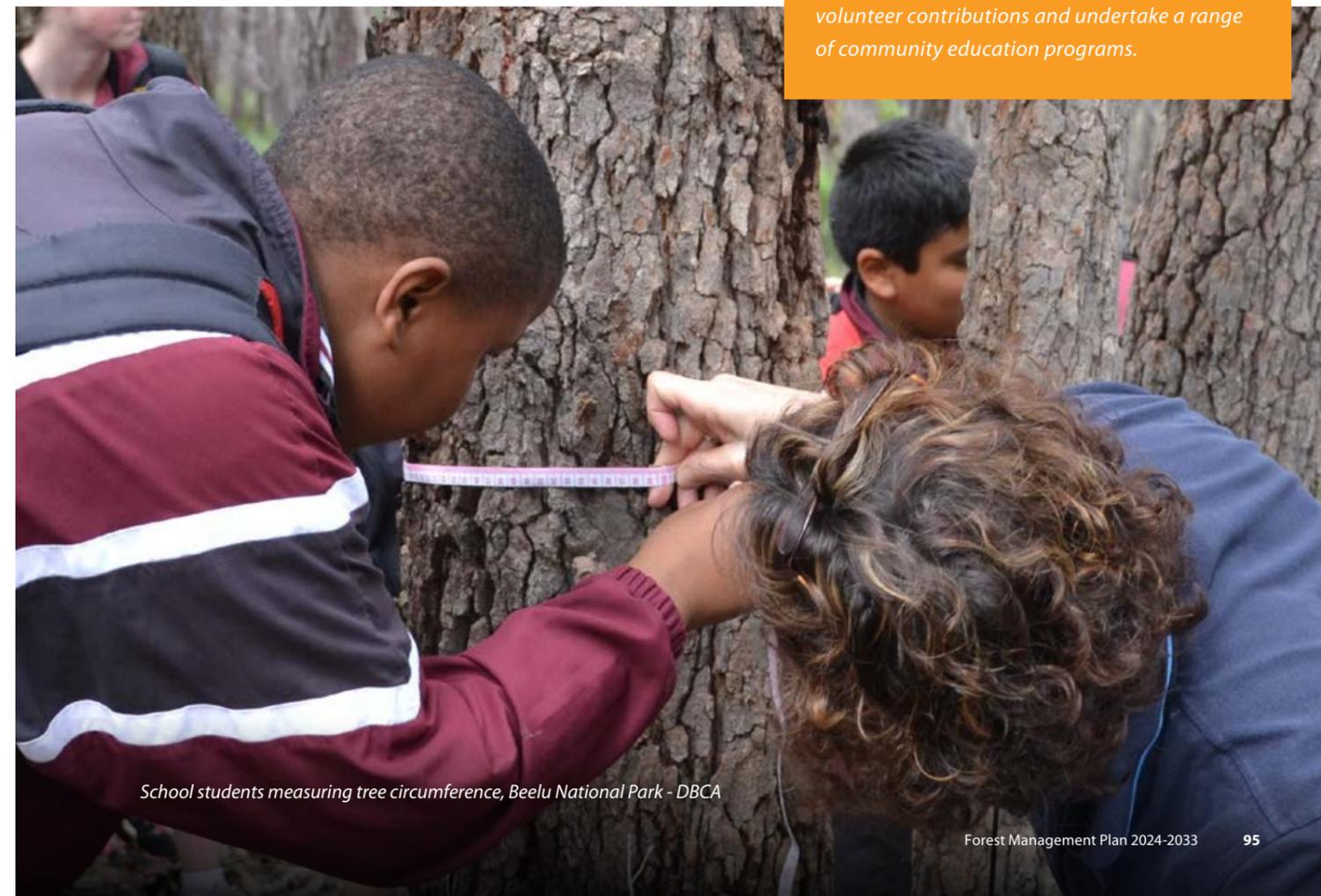
This plan seeks to engage with the public and stakeholders to co-design how the department undertakes stakeholder engagement on forest management activities.

Ongoing engagement will continue to be sought with the public and stakeholders such as scientific experts, community groups, beekeepers, industry and utility organisations and tourism and recreation operators, to share knowledge and data, relating to active management and adaptive management directions. In implementing this plan, the department will also continue to facilitate and encourage volunteer contributions and undertake a range of community education programs.

A summary of management directions for stakeholder and community engagement is outlined in Table 29, with the associated KPI for Foundation 4 – Social and economic benefits and opportunities outlined in Table 30. These management directions are designed to meet general functions of the department.

²⁴ www.dbca.wa.gov.au/management/managing-natural-areas/forests/forest-management-plan

In implementing this plan, the department will also continue to facilitate and encourage volunteer contributions and undertake a range of community education programs.



School students measuring tree circumference, Beelu National Park - DBCA

Table 29: Summary of management directions for stakeholder and community engagement

Key points and considerations	
<ul style="list-style-type: none"> Community involvement is an integral part of the department’s operations. In particular, the contributions made by volunteers are recognised and highly valued. Community and stakeholder engagement during the FMP planning process identified that stakeholders and the public have a desire to contribute to the development and implementation of the plan. 	
Management objective	Management activities
1. Provide for a range of opportunities for stakeholder and community engagement.	Seek to develop an engagement platform and approaches to facilitate stakeholder and community participation in the implementation of this plan.
	Provide for and encourage community participation in voluntary activities including conservation works, citizen science, monitoring, educational and social development programs.
	Provide targeted education programs and materials for schools, general community, and stakeholder groups that shape understanding, appreciation and sustainable use of the south-west forests and their management.
	Provide clear and easily accessible information about the values, pressures, use and management of the south-west forests through a mix of communication materials, to reach a range of audiences.
Relevant Commission position statements and DBCA policies and guidelines	
Corporate Policy Statement 15: Volunteers and community involvement Corporate Guideline 43: Public participation	

Table 30: Key performance indicator for Foundation 4

Visitor experience and access to goods and services on lands covered by the plan	
Strategic goal	To deliver social, cultural and economic benefits through the provision of goods and services.
Performance measures	Management targets
Visitor satisfaction at DBCA recreation sites.	Meet or exceed 85 percent (DBCA benchmark) for visitor satisfaction.
Trend in utilisation of forest goods and services.	Provide access to the forests for economic and social uses.



6 Part D – Plan implementation, assessment and adaptive management

Adaptive management, or ‘learning by doing’ has long been the basis of many environmental programs. Adaptive management will be a key component of the management approach to implement this plan (refer to Figure 3), recognising that there is an incomplete knowledge of values and forest ecosystems, their responses to natural and human-induced disturbances and the effects of management practices. The capability to undertake adaptive management depends on effective collaboration and learning to continually improve planning, implementation, evaluation and adjustment processes.

6.1 Plan

Western Australia’s national parks, conservation parks, nature reserves, State forests and timber reserves are vested in the Commission, an independent body established under the CALM Act. Its functions include preparation of management plans for these lands as prescribed in Part V of the CALM Act. DBCA manages land vested in the Commission (CALM Act land) according to CALM Act management plans and within available resources. Under the BC Act, DBCA also has responsibility for the protection of indigenous flora and fauna across all land tenures in Western Australia.

This plan is a statutory management plan prepared in accordance with Part V of the CALM Act. The Commission has developed this plan through the agency of DBCA, in consultation with FPC in respect of State forest and timber reserves, and with DWER in respect of PDWSAs. As detailed in Section 2.3, the plan has also been informed by consultation with other agencies, key stakeholders and the public.

This FMP establishes strategic goals which provide direction based on legislation, government policy, community feedback, ESFM principles and Montreal Process Criteria (see Section 2.5).

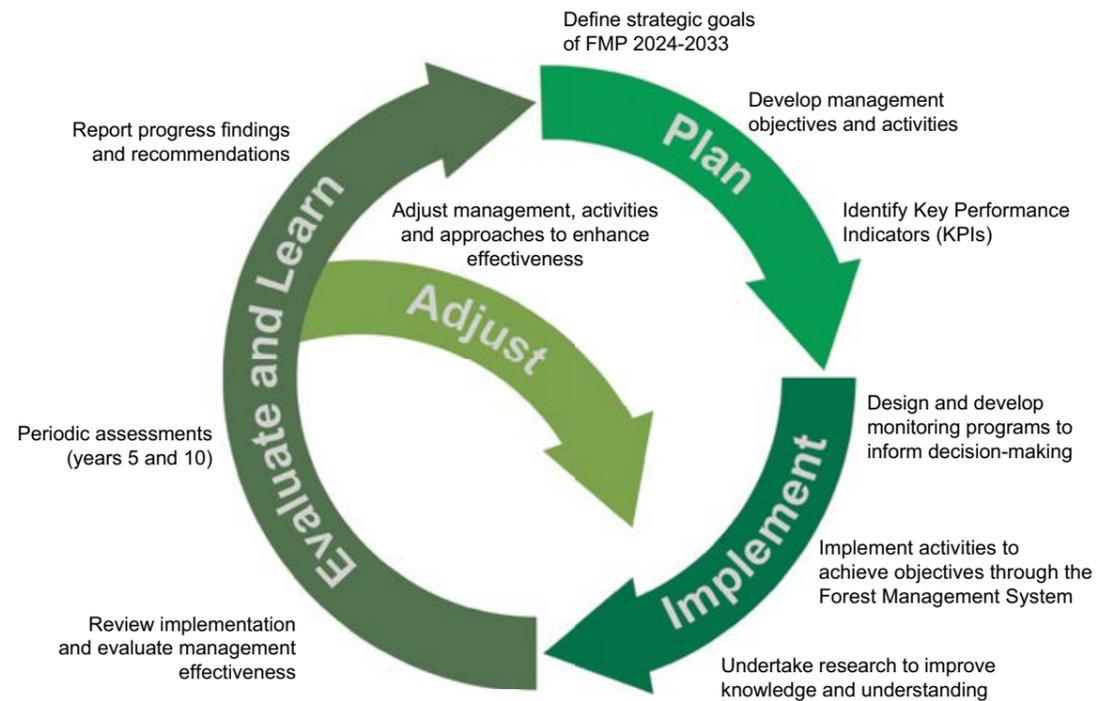


Figure 3: Adaptive management cycle and relationship to FMP 2024-2033

6.2 Implement

This plan will be implemented through the State's Forest Management System, and through monitoring and research, according to available resources.

6.2.1 Forest Management System

Implementation of management activities will be through the Forest Management System guided by the suite of legislation, policies and guidelines, codes of practice, procedures, plans and management processes for forest management, of which this plan is an important component. It is designed to achieve conservation and management outcomes across both public and private land tenures within the south-west region. The system has a hierarchy of integrated components, including an overarching legislative (both Commonwealth and State) framework, supported by national and state policies, and underpinned by the planning and operations management systems that guide forestry activities. A description of the Forest Management System is on the [DBCA Managing our forests webpage](#)²⁵.

The key State and Commonwealth legislation which underpin the Forest Management System and have relevance to this plan and the planning area have been referenced throughout the plan. Copies of legislation are available on the [Western Australian Legislation website](#)²⁶. Relevant position statements of the Commission and DBCA policies and guidelines also guide implementation (refer to Part C). Under this plan subsidiary documents will be prepared and/or revised as needed according to departmental policy.

An implementation plan will be prepared for the commencement of the FMP 2024-2033 that considers and defines the roles, responsibilities, priorities, staging, evaluation, and reporting and resourcing for undertaking the management activities detailed under the four foundations in Part C and scope of Part D.

Formal management partnerships will be established between DBCA and the respective Noongar Regional Corporations for State forests, timber reserves and conservation reserves in the planning area. These new cooperative and joint management arrangements recognise that Noongar people have continuing connections to the area and a cultural responsibility to care for country.

Partnerships and other arrangements may be entered into with other stakeholders as opportunities arise.

²⁵ dbca.wa.gov.au/management/managing-natural-areas/managing-our-forests

²⁶ legislation.wa.gov.au/legislation/statutes.nsf/

6.2.2 Monitoring

Implementation will be assisted by monitoring programs to inform decision-making for ongoing forest management for the life of the plan, and to provide information to support reporting requirements. Management will be informed by understanding how pressures and disturbances are addressed through management intervention and how key values and components of forest health change over time. Consistent with the principles of adaptive management, improvement of management activities will continue to be informed by monitoring.

The department will implement an integrated approach, involving the systematic collection and collation of data and knowledge to monitor, identify and analyse changes and trends, and contribute to the evaluation of management effectiveness. Monitoring data will be collected in a statistically rigorous manner, that facilitates analysis. Additionally, anticipated advances in monitoring technologies, statistical analysis and other methodological aspects over the next decade will be adopted as appropriate. This integrated approach will enable the monitoring, evaluation and reporting of both outcome-focused key performance indicators and output-focused management activities.

Forest health monitoring

The forest health monitoring component will contribute to the evaluation of effectiveness of the performance measures outlined in Foundations 2 and 3, addressing strategic goals that aim to conserve biodiversity, maintain or improve forest health, and enhance climate resilience.

The forest health monitoring program will determine the status of key biodiversity and environmental components of forest ecosystem condition; detect and quantify changes in key forest ecosystem components to understand and predict patterns and drivers of change (pressures); assess the effectiveness of biodiversity conservation and environmental management activities (response); and inform forest managers, the broader community and policy makers.



The forest health monitoring program will determine the status of key biodiversity and environmental components of forest ecosystem condition; detect and quantify changes in key forest ecosystem components to understand and predict patterns and drivers of change (pressures); assess the effectiveness of biodiversity conservation and environmental management activities (response); and inform forest managers, the broader community and policy makers.

Measuring vegetation surface moisture content using a fine fuel moisture meter, Donnelly State Forest, Manjimup - DBCA

Suitably informative and cost-effective monitoring indicators will be identified across key forest ecosystem components, relating to biodiversity, forest structure, processes affecting forest health, soil and water, and carbon dynamics.

Monitoring of forest health will be scientifically robust, contributing to decision support tools and models, as well as a broader ecological understanding of forest ecosystems. DBCA will develop the monitoring framework based on best practice forest monitoring and drawing on relevant expertise on indicators of ecosystem health. Data collected through forest health monitoring will inform decision making for ongoing forest management for the life of the FMP, contribute to the reporting requirements of Australia's State of the Forests Report, and be aligned with relevant Montreal Process Criteria. Where appropriate DBCA will partner with external organisations such as universities, citizen scientists and industry to undertake relevant research. An implementation plan for the Forest Health Monitoring Program will be publicly available within twelve months of the commencement of the plan.

Other monitoring programs relevant to the implementation of this plan will have a focus on disturbance activities, visitor satisfaction and the levels of traditional owner engagement and involvement.

6.2.3 Research

To more fully understand inter-relationships within and between key values, components of forest health, pressures and management activities, research will be undertaken to support progress towards achieving strategic goals, building on previous studies. The department seeks to target scientific research related to issues of high priority for management of biodiversity conservation and landscape scale land management. Research in collaboration with Noongar Traditional Owners is also anticipated to be an emerging area over the life of this plan.

Achievement of the objectives identified in this plan will be facilitated by research that improves knowledge and understanding of key values and the response to disturbances and management intervention. Where knowledge is incomplete and the understanding of the impacts is uncertain, proposed operations identified in this plan are conservative, based on a precautionary approach, and may be adapted as new knowledge becomes available.

A specific research program will be implemented over the life of the plan to investigate the impacts of fire management strategies and bushfires on forest ecosystems and biodiversity. The outcomes of this research program will complement DBCA's ongoing adaptive management approach to managing our south-west forests. The department will report the research results to the Conservation and Parks Commission and make the research findings publicly available. The research program will involve experts in fire ecology and related fields from DBCA and across the various research institutions in Western Australia.

Knowledge gaps and research opportunities.

While there is a great deal of evidence to support current practices, there remain many important knowledge gaps that need to be addressed to improve understanding and inform future management. This is particularly the case with the change in direction of forest management and the ongoing impacts of climate change. Findings from research will be made publicly available and integrated as part of adaptive management. Key knowledge gaps relating to forest health and forest management and areas for further research are summarised below. Addressing these knowledge gaps will improve forest health outcomes and enable the department to anticipate and respond to future changes including climate.

Research will be integrated to consider interactions and prioritised to address knowledge gaps related to forest conservation, forest health and forest management, such as:

- Biodiversity patterns - Effective design and expansion of the conservation estate is underpinned by an understanding of the patterns in composition, diversity and distribution of the species and ecosystems it seeks to protect.
- Key species and ecosystems - Effective management of key species and ecosystems is supported by knowledge of their ecology, status and threats.
- Forest function - Understanding changes to forest health requires knowledge of forest structure and condition, and effects of ecological and physical processes.
- Fire regimes - Knowledge of fire behaviour and fire ecology will inform the application of appropriate fire regimes, balancing the protection of life and property with conservation and cultural values.

- Pest animals, disease, and weeds - Knowledge of biological threats, their interactions, and approaches for effective management, informs protection of biodiversity and forest health.
- Climate mitigation and adaptation strategies - Responding to current impacts of climate change on forest biodiversity and resilience, and forecasting future impacts, is underpinned by knowledge and understanding of mitigation and adaptation actions.
- Restoration - Effective landscape and habitat rehabilitation and restoration of degraded forest ecosystems relies on knowledge of species and processes.

Knowledge gaps will be addressed through research projects undertaken by the department and through collaborations with other research providers, and by working with non-government organisations, industry, land management partners, traditional owners and the community (including regional Natural Resource Management groups). Research will be prioritised according to knowledge gaps to best facilitate effective management and improve biodiversity and forest ecosystem health. Research and monitoring sampling design, methods and results will be made available through relevant publications, which will include scientific peer-review. Data on species and ecological communities collected through monitoring and research will be made publicly available through the [Dandjoo biodiversity data repository](#)²⁷.

Research initiatives may need to be designed and undertaken for other areas relevant to the plan, for example to meet obligations to protect and conserve the value of the land to the culture and heritage of Aboriginal people, and to support nature-based tourism and recreational aspects of the department's land management responsibilities.

6.3 Evaluate and learn

Progress towards achieving the objectives of this plan will be demonstrated by regular monitoring, evaluation and reporting. Mechanisms to assess the effectiveness of management are important components of an adaptive management framework and signal where management may need to be adjusted if it is not successfully meeting management objectives²⁸. The Commission and DBCA will use KPIs and/or other surrogates to assess the implementation and success of this plan.

6.3.1 Key performance indicators (KPIs)

KPIs have been developed as part of the planning process to measure the overall effectiveness of management activities and progress towards achieving the strategic goals. The set of KPIs presented in Part C of this plan reflects the highest management priorities and provides a focus for monitoring, evaluation and reporting to inform an adaptive management approach. The KPIs include performance measures and management targets. Further indicators, approaches and elements may also be developed and used during the life of this plan as part of implementation. Protocols for collecting data and reporting for each KPI will be established and updated as required.

6.3.2 Periodic assessments

The Commission has responsibility for assessing the implementation of this plan in accordance with the CALM Act²⁹. Periodic assessments of the implementation of the plan enable the Commission and DBCA to ascertain the suitability, adequacy and effectiveness of management activities and to determine whether the plan, or relevant policies and guidelines, should be amended.

Periodic assessments of KPIs will provide an assessment of the extent of achievement of the FMP strategic goals and will involve analysis of results, identifying issues and any related underlying causes and developing recommendations to improve performance. Internal and external stakeholder groups (including managers, operational staff and community groups) will be informed or involved where appropriate, to achieve greater acceptance, ownership and commitment to the periodic assessment process.

²⁷ bio.wa.gov.au/dandjoo

²⁸ Refer to Corporate Policy Statement 2: Management effectiveness dca.wa.gov.au/about-us/legislation/corporate-policies

²⁹ Refer to Commission Position Statement 16: Periodic performance assessment of the implementation of management plans conservation.wa.gov.au/publications/position-statement

Periodic assessment reports will specifically address:

- The effect of ecological thinning in achieving strategic goals, including a description of any changes to guidelines and prescriptions as evidence of the adaptive management cycle and the outcomes of the independent review.
- The timelines, progress and challenges for implementing previously and newly proposed conservation reserves.
- The effect of prescribed burning in achieving strategic goals, including a description of any changes to policies and practices as evidence of the adaptive management cycle.

Due to the scale, complexity and resources available to conduct the work and to allow adequate time for the trend data to be acquired, these assessments shall be published at years 5 and 10 of plan implementation on the Commission's and DBCA's websites, with key findings and recommendations to be made public to inform stakeholders and the public on the implementation status of the FMP.

The outcomes of performance assessment also assist in promoting the practice of adaptive management.

6.3.3 Management effectiveness evaluations

Departmental management effectiveness evaluation processes will be undertaken biennially to assess progress on the delivery of management activities, the condition of values and pressures on those values. This will inform the evaluation of management effectiveness in achieving the strategic goals and management objectives of the plan, as well as contributing to the measurement of KPIs against targets. These evaluations will also inform the periodic assessments. Departmental staff, including scientists, managers and policy officers, will collaborate to undertake management effectiveness evaluations.

6.3.4 State, national and international reporting obligations

The south-west forests have global significance and various obligations have been entered into for protecting and periodic reporting on particular forest values within the planning area. These include the international Ramsar Convention on Wetlands of International Importance, international Migratory Bird Agreements, the WA RFA, the national State of the Forests reports, Australia's Strategy for Nature, and the Strategy for the National Reserve System. While international and national reporting processes are usually coordinated through Commonwealth Government agencies, these reporting processes operate alongside monitoring and reporting on State or regional-level strategies such as the FMP.

The four strategic goals accommodate the seven Montreal Criteria; and management activities will be aligned with and reported against the Montreal Criteria consistent with current practices.

During the 10-year life of this plan, information on the condition of natural forest values within the planning area will also contribute to new initiatives associated with implementation of the *Native vegetation policy for Western Australia* (DWER 2022b) and the *Western Australian Climate Policy* (DWER 2020).

6.4 Adjust

The fourth component of the adaptive management framework refers to the adjustment of plans and management activities and approaches in response to changes in circumstances or understanding, and using evidence and learnings to inform these decisions. An example of this process within the planning area has been the *Western Shield* program where fox baiting has been undertaken since 1996. This has included broadscale monitoring of fauna populations to progressively refine the frequency and season of baiting, as well as the relative effectiveness of baiting within different landscapes.

The adaptation or adjustment of management practices in the term of this plan will become increasingly relevant in the face of climate change. The introduction of ecological thinning in targeted forest areas that are vulnerable to drying and warming conditions will also rely on new knowledge and information from operational trials during the plan period. Such adaptive approaches will enable thinning prescriptions or regimes to be adjusted and refined across forest ecosystems, and for the necessary supporting policies and guidelines to be developed.

As part of the adaptive management cycle, existing or proposed policies and guidelines of the department (and in some cases, those of others endorsed by the department) may also be revised from time to time or be replaced during the period of the plan, further demonstrating a commitment to continuous improvement.

Table 31: Summary of management directions for Part D

Key points and considerations	
<ul style="list-style-type: none"> • An adaptive management approach will be taken to implementing this plan, informed by monitoring results, research findings and other evidence and learnings. • The plan will be implemented through the State's Forest Management System. • Formal management partnerships will be established between DBCA and respective Noongar Regional Corporations. • The Forest Health Monitoring Program will identify and collect data on monitoring indicators across key forest ecosystem components, relating to biodiversity, forest structure, processes affecting forest health, soil and water, and carbon dynamics. • Scientific research will target issues of high priority for management of biodiversity conservation and landscape scale land management. • KPIs, periodic assessments and management effectiveness evaluations will contribute to the evaluation and learn component of the adaptive management cycle. 	
Management objective	Management activities
1. Undertake adaptive management based on evidence and learning to continually improve planning, implementation, evaluation and adjustment processes.	An implementation plan will be prepared for commencement of the FMP 2024-2033 on how management activities will be undertaken.
	Subsidiary documents such as policies and guidelines will be prepared and/or revised according to departmental policy.
	A Forest Health Monitoring Program implementation plan will be developed and be publicly available within twelve months of commencement of the plan.
	Produce and publish a report on the activities undertaken and implementation of the Forest Health Monitoring Program every two years.
	Undertake a specific research program investigating the effects of fire management strategies and bushfires on forest ecosystems and biodiversity, over the life of the plan.
	Publish research addressing key knowledge gaps in relevant publications.
	Periodic assessments of KPIs will be published at years 5 and 10 of plan implementation.
	Management effectiveness evaluations will be conducted every two years.
Relevant Commission position statements and DBCA policies and guidelines	
Position Statement 16: Measuring the implementation of management plans CALM Act section 19(g) functions. Corporate Policy Statement 2: Management effectiveness Corporate Policy Statement 28: Science	

Appendices



Appendix 1a Land categories by extent within the planning area (as of June 2022)

Section 5 of the CALM Act specifies the categories of land to which the Act applies, and section 6 defines those land categories. For the purposes of the plan the relevant land categories are: State forest, timber reserves, national parks, conservation parks, nature reserves, other land that was reserved under the (now repealed) Land Act 1933 and vested by order under that Act in the Conservation and Parks Commission ('section 5(1)(g) reserves') and any other land other than excluded waters, reserved under Part 4 of the *Land Administration Act 1997*, the care control and management of which are placed by order under that Part with the Conservation and Parks Commission ('section 5(1)(h) reserves').

The CALM Act sets out purposes that guide the design of management plans for these categories of land and the management of that land. A purpose of protecting and conserving the value of land to the culture and heritage of Aboriginal persons applies to all land managed under the CALM Act. In addition, further purposes as set out in the table below apply to particular categories of land. The FMP 2024–2033 has been designed to achieve these purposes.

Land category	Purpose	Gazetted (hectares)	Proposed ⁵ (hectares)	Total (hectares)
Indigenous State forests and timber reserves	The management objectives are the purposes, or combination of purposes, that are provided for in a proposed management plan. This must be one or more of the purposes listed in section 55(1a) of the CALM Act and Regulation 81 of the CALM Regulations.	1,189,600	5,600	1,195,200 ^{1,2,4}
National park	National parks have national significance, and their purpose is to fulfil so much of the demand for recreation by members of the public as is consistent with the proper conservation of the natural environment, the protection of flora and fauna and the preservation of any feature of archaeological, historic, or scientific interest.	816,700	125,500	942,200
Nature reserve	Nature reserves are to: <ul style="list-style-type: none"> conserve the natural environment protect, care for and promote the study of indigenous flora and fauna and preserve any feature of archaeological, historic or scientific interest. 	150,100	51,500	201,600

Land category	Purpose	Gazetted (hectares)	Proposed ⁵ (hectares)	Total (hectares)
Conservation park	Conservation parks are of regional or local significance, have the same management objectives as national parks and are managed identically to national parks.	30,500	78,300	108,800
Section 5(1)(g) and 5(1)(h) reserves	No set purpose applies but 'recreation or conservation' is a common purpose applied to section 5(1)(g) or 5(1)(h) reserves.	16,600	7,300	23,900
Forest conservation area	Classification of land as a forest conservation area is used to provide a higher level of security of classification for areas that have some impediment to being considered for a formal conservation reserve category. Management priority is maintenance of biodiversity but can allow for multiple use outcomes.		41,000	41,000
Conservation reserve	While the department prefers these parcels of land to become conservation reserve, the specific proposed tenure and class will be subject to government consideration and determination.		9,200	9,200
Totals ⁵		2,203,500	318,400	2,521,900 ³

Notes:

- Areas of State forest and timber reserve are exclusive of those areas proposed for addition to reserves.
- There are 50,200 hectares set aside as pine plantation and 3,400 hectares of forest dominated by exotic eucalypt species on State forest and timber reserves (covered by this plan and included in Appendix 1a). The exotic eucalypts are mainly within rehabilitated mining areas.
- There are a further 12,300 hectares of pine plantation and 6,600 hectares of native forest on freehold land held in the name of the Conservation and Land Management Executive Body (not covered by this plan) within the department's Swan, South West and Warren regions.
- The area of State forest and timber reserve includes areas proposed for investigation to contribute to at least 400,000 hectares for improved protection.
- The proposed areas include some already gazetted reserves that are proposed to change to an alternate land category. For example, Moore River National Park is proposed to change to the nature reserve category.

Appendix 1b Areas of forested lands vested in the Commission

Areas and percentage forested of FMP lands and lands vested in the Commission (as at June 2022)

	Area (ha)	% forested
Total FMP planning area (all Crown land tenures)	2,833,300	83
Lands currently vested in the Commission	2,434,800	80

Note: 'Forested' includes all jarrah, karri, wandoo and other dominant forest ecosystems

Appendix 1c Disturbance Avoidance Zones in State forest and timber reserves

The types, purpose of and criteria for disturbance avoidance zones are described below.

Zone Type	Purpose	Criteria for inclusion in department's corporate database
Old-growth forest	Protect areas of old-growth forest outside the formal reserve system	<p>Areas of jarrah forest larger than two hectares that have not been infested with <i>Phytophthora</i> dieback, where the effects of anthropogenic disturbance (e.g., timber production, mining, grazing) are either absent or now negligible.</p> <p>Areas of karri forest larger than two hectares where the effects of anthropogenic disturbance (e.g., timber production, mining, grazing) are absent and which are dominated by trees in the late-mature to senescent growth stage.</p> <p>Areas of wandoo forest or woodland larger than two hectares where the effects of anthropogenic disturbance (e.g., mining, timber production) are absent.</p>
River and stream zones	<p>Provide forest undisturbed by timber harvesting</p> <p>Protect water quality</p> <p>Protect aesthetic and social values</p> <p>Protect productive capacity, soil values and carbon pools</p>	<p>A 60-metre wide corridor in the area of first, second and third order³⁰ streams, with all boundaries being at least 20 metres from the bank of the stream.</p> <p>A 150-metre wide corridor in the area of fourth order streams, with all boundaries being at least 50 metres from the bank of the stream.</p> <p>A 400-metre wide corridor in the area of fifth order streams, and streams of any higher category, with all boundaries being at least 100 metres from the bank of the stream.</p>
Diverse ecotype zones	Protect sensitive ecosystems	Rock outcrops, greater than 0.2 hectares, swamps and wetlands, heath, sedge, herb and low-density woodland communities. Ecological characteristics will be used to determine the boundary of these zones, which are defined in the department's corporate database by vegetation codes.
Travel route zones	Protect aesthetic and social values	<p>A corridor that extends at least 200 metres from each side of Level 1 travel routes in the Warren Region³¹.</p> <p>A corridor that extends at least 100 metres from each side of Level 2 travel routes in the Warren Region.</p> <p>A corridor that extends at least 200 metres from each side of the Bibbulmun Track.</p> <p>Munda Bididi Trail travel route zones include a:</p> <ul style="list-style-type: none"> • 200 metre zone around Munda Bididi Trail campsites (i.e., 400 metre diameter zone) • 50 metre zone around bridges and crossings that form part of its designated route (i.e., 100 metre total width of zone) • 50 metre zone around sections of constructed 'single' trail (i.e., 100 metre total width of zone) where appropriate.

³⁰ Classification system for width and importance of streams, varying from one for minor streams, to seven for major streams or rivers.

³¹ Classification system for viewer sensitivity levels. Level one includes highways and other main roads with high usage (sealed or unsealed). Level two includes main roads with moderate levels of usage (sealed or unsealed). Note: except for the Bibbulmun Track, and parts of the Munda Bididi Trail, travel route zones apply only in the Warren Region.

Zone Type	Purpose	Criteria for inclusion in department's corporate database
Less well-reserved vegetation complexes	Provide additional protection for the less well-reserved vegetation complexes that occur on State forest and timber reserves	<p>Vegetation complexes that have either:</p> <ul style="list-style-type: none"> • less than five percent of their pre-European area in existing or proposed formal and informal reserves; or • between five and 10 percent of their pre-European area in existing or proposed formal and informal reserves and less than 15 percent of their pre-European area remaining. <p>The less well-reserved vegetation complexes currently on the department's corporate database are BLf (Balingup valley floors); BT (Bridgetown); Fo (Forrestfield); ML (Mumballup); NWf2 (Newgalup); NWg1 (Newgalup); SC (Sidcup); TP (Toponup); Wi (Williams); Yd (Yelverton sandy deposits); Yw (Yelverton valleys and depressions).</p>
Poorly reserved forest ecosystem	Provide additional protection for a poorly reserved forest ecosystem that occurs on State forest and timber reserves	Forest ecosystems that have less than 15 percent of pre-European area in existing or proposed formal plus CAR informal reserves. These currently include Darling Scarp, Jarrah Forest – Leeuwin Ridge, Jarrah Forest – Swan Coastal Plain and Tuart Forest ecosystems.
RFA-accredited linkage zones	Provide low-disturbance linkage zones	The areas identified in the department's corporate database that provide a link between the proposed Milyeannup National Park and an adjacent stream zone, and a corridor between the Helena and Flynn parts of the proposed Helena Valley National Park.
Fauna Habitat Zones	Patches of forest systematically distributed across the landscape which are temporarily excluded from disturbance	Are located in accordance with the Guideline for the Selection of Fauna Habitat Zones (Department of Parks and Wildlife 2017).

Appendix 2 Montreal Process criteria for the conservation and sustainable management of temperate and boreal forests

The United Nations Conference on Environment and Development (Rio Earth Summit) 1992 expediated recognition of the environmental, social and economic importance of world forests and development of the concept of sustainable forest management. In 1994 the Montreal Process Working Group³² began developing a set of criteria and indicators as guidelines for assessing national forest trends and sustainable forest management in temperate and boreal forests. Australia is one of 12 member countries that have adopted these criteria, known as the Montreal Criteria.

Criterion 1: Conservation of biological diversity

Criterion 2: Maintenance of productive capacity of forest ecosystems

Criterion 3: Maintenance of ecosystem health and vitality

Criterion 4: Conservation of soil and water resources

Criterion 5: Maintenance of forest contribution to global carbon cycles

Criterion 6: Maintenance and enhancement of long-term multiple socio-economic benefits to meet the needs of societies

Criterion 7: Legal, institutional, and economic framework for forests conservation and suitable management

Each criterion is characterised by a set of quantitative and qualitative indicators. Measurement of each indicator over time shows changes in trends for environmental, social, economic and policy conditions. Monitoring these changes provides information needed to evaluate a country's progress to sustainable forest management and is essential to making informed forest policy decisions.

A framework for development of these criteria and indicators is described in the document, *Australia's Sustainable Forest Management Framework of Criteria and Indicators 2008 - Policy Guidelines* (Commonwealth of Australia 2008). National reporting using the Montreal indicators has been undertaken on a five-yearly cycle with the latest State of the Forests report available on the Department of Agriculture, Fisheries and Forestry [website](#).³³

Appendix 3 Number of species listed as threatened and priority flora in the planning area

(Western Australian status for South West, Swan and Warren DBCA Regions, table generated from Florabase, updated from the Threatened and Priority Flora database, 24 May 2022)

	EX	CR	EN	VU	P	Total
Vascular plants	4	39	47	28	583	701
Non-vascular plants		1			7	8
Lichens					13	13
Fungi					12	12

Key

EX = Extinct; CR = Critically endangered species; EN = Endangered species; VU = Vulnerable species; P = Priority species

³² montreal-process.org/The_Montreal_Process/Working_Group/

³³ agriculture.gov.au/abares/forestsaustralia/sofr/sofr-2018

Appendix 4 Number of species listed as threatened and priority fauna in the planning area

(Western Australian status for South West, Swan and Warren DBCA Regions, list published October 2022)³⁴

	CR	EN	VU	CD	OS	P	MI	Total
Amphibians	1		2			1		4
Birds	7	14	16	1	1	9	53	101
Fish		4	2			1		7
Invertebrates	4	7	3			25		39
Mammals	2	2	2	2		5		13
Reptiles	1		1			8		10

Key

CR = Critically endangered species; EN = Endangered species; VU = Vulnerable species; CD = Conservation dependent;

OS = Other specially protected fauna; P = Priority species; MI = Migratory species

Appendix 5 Cooperative and Joint Management

Through the South West Native Title Settlement (Settlement), Noongar people and the department will enter into formal agreements to recognise their mutual rights and obligations in managing the South West Conservation Estate (all CALM Act land in the Settlement area). The FMP area covers about half of the South West Conservation Estate. These cooperative and joint management arrangements will be established in a two-staged process:

Stage 1: Cooperative Management

Six Cooperative Management Agreements (CMAs), one for each of the six Noongar Agreement Areas, will be signed by the department and the relevant Noongar Regional Corporation (NRC). The agreements will apply to the whole of the South West Conservation Estate within that Agreement Area. As shown on Map 4, the planning area has relevance to all six NRCs, though to differing degrees. The footprint of FMP lands covers the full extent of the Whadjuk and the Karri Karak Agreement Areas; large parts of the Gnaala Karla Booja and the Wagyl Kaip and Southern Noongar Agreement Areas; and smaller portions of the Yued and the Ballardong Agreement Areas.

Cooperative management is a strategic, high-level approach to building partnerships between the department and the Noongar community and managing the Conservation Estate together. A Cooperative Management Committee (CMC) will be established to implement each CMA. Each CMC will comprise senior DBCA staff and six Noongar representatives as nominated by the respective NRC. The committees will meet at least three times a year and have the ability to establish sub-committees on specific issues. The role of the CMC includes:

- Select and advise on identifying conservation estate for formal joint management agreements under the CALM Act.
- Provide advice on management plans and Aboriginal heritage issues.
- Provide advice on how best to “protect and conserve the value of the land to the culture and heritage of Aboriginal people”.
- Assist in the preparation of relevant policies, programs and other management documents.
- Provide advice on customary activities and be the key reference point for ‘local area arrangements’.
- Provide advice on Aboriginal employment and economic development initiatives.
- Review opportunities for Noongar participation in contracting and other economic development activities.

Stage 2: Joint Management

Once established, the Cooperative Management Committees will, among other things, work to identify and prioritise specific areas of the South West Conservation Estate to be jointly managed by Joint Management Bodies (JMBs) established under Joint Management Agreements (JMAs). At least one JMA for a specific park or reserve in each Agreement Area will be in place within the first five years of the commencement date of the Settlement (i.e., by 25 February 2026). At least one further JMA will also be created in another part of each Agreement Area within 10 years of the commencement date of the Settlement (i.e., by 25 February 2031).

Consequently, over the life of the plan, a number of parks and reserves in the planning area will become jointly managed with Noongar Traditional Owners.

³⁴ dbca.wa.gov.au/management/threatened-species-and-communities

Appendix 6 Processes for consent to undertake mineral, petroleum and geothermal resource activities in State forests and other CALM Act reserves

Unless otherwise specified in the CALM Act, nothing in the Act takes precedence over mining, petroleum and State agreement legislation in Western Australia. The following provides a brief summary of applicable processes for authorisation of resource activities in State forests and other CALM Act reserves.

Mineral exploration and development (mining)

Mining on land in Western Australia is predominantly regulated under the Mining Act. Section 23(1) of the Mining Act provides the right for any person to apply to the Minister for Mines and Petroleum (or delegate) for a mining tenement (Exploration Licence, Prospecting Licence, Miscellaneous Licence, Mining Lease, General Purpose Lease) over certain lands, including State reserves such as State forests and other reserves managed under the CALM Act.

Section 23(2), however, specifies that the holder of a mining tenement in respect of such land "... must not carry out mining on or under that land otherwise than in accordance with a relevant consent obtaining in relation to that land..." The specific procedural requirements for consent for mining on the various State terrestrial reserves (including State forests) by the Minister responsible for the Mining Act (Minister for Mines and Petroleum) are set out in some detail within section 24 of the Mining Act.

The requirements under section 24 include requirements for consultation with the "responsible Minister" for the land and in some cases also the "local government, public body, or trustees or other persons in which the control and management of such land is vested with respect thereto" prior to any decision to give consent "either conditionally or unconditionally" to mining within the subject reserve. Depending on the type, category and location of the affected reserve, the Minister responsible for the Mining Act must obtain either the recommendations or the agreement (referred to as 'concurrence') of the consulted party/ies with respect to any decision to consent.

In addition to the above requirements, section 24 also requires that for certain reserve types [namely national parks, class A nature reserves and other class A reserves in the south-west (including conservation parks)], the grant of a Mining Lease or General Purpose Lease must not occur without the consent of both Houses of Parliament by resolution, "and then only on such terms and conditions as are specified in the Resolution" (S24(4)).

The table below summarises the provisions of section 24 relating to consent for mining in various reserve types managed under the CALM Act and Parliament's role in relation to the grant of mining or general-purpose leases.

Approval and regulation of certain mining operations, including bauxite mining operations within the FMP area, is regulated under State Agreement Acts such as the *Alumina Refinery Agreement Act 1961*, the *Alumina Refinery (Worsley) Agreement Act 1973* and the *Collie Coal (Western Collieries) Agreement Act 1979*. State Agreement Acts provide for a legal agreement between the government and project proponents relating to obligations and rights to undertake mining and other activities on public lands. In general, and unless otherwise stated therein, State Agreement Acts override provisions of other legislation such as the Mining Act and the CALM Act where there may be inconsistencies.

Petroleum exploration and development

The PGER Act is the primary legislation used to regulate petroleum and geothermal exploration and development on land in Western Australia. There are also subsidiary regulations under the PGER Act covering specific requirements.

Petroleum exploration and development is generally permitted on any Crown land or private land throughout the State, however, the consent of the Minister for Mines and Petroleum is required prior to entry to reserve land (including State forests) for the purposes of carrying out petroleum or geothermal exploration operations, or operations for the recovery of petroleum or geothermal energy. Any such consent may be subject to any conditions that the Minister thinks fit being imposed on the petroleum permit, drilling reservation, access authority, special prospecting authority, lease or licence. Such conditions may include conditions "for the purpose of ensuring, so far as is practicable, that any operations carried out on the land under the authority of the permit, drilling reservation, access authority, special prospecting authority, lease or licence are carried out in such a manner as to minimise the risk of damage to any native fauna or flora on the land".

Prior to granting of any consent for entry to a reserve for petroleum or geothermal activities, the Minister for Mines and Petroleum is required to consult and obtain the recommendations of the Minister responsible for the reserve (Minister for the CALM Act in the case of State forests and other CALM Act reserves) regarding recommendations on the conditions, if

any, which should be included in the permit, drilling reservation, access authority, special prospecting authority, lease or licence.

Environmental impact assessment of mineral, petroleum or geothermal exploration, extraction or development.

As for other developments in Western Australia, proposals to undertake mineral or petroleum exploration or extraction and related activities in reserves may be subject to the requirement under Part IV (section 38) of the EP Act for referral of proposals that may have a 'significant effect on the environment'. Following any referral under Part IV of the EP Act, proposals may be subject to a requirement for 'environmental impact assessment' and environmental approval by the Minister for Environment. Proposed mineral or petroleum-related activities that are subject to impact assessment and receive environmental approval under the EP Act may not proceed unless consent for mining is also provided under the Mining Act or PGER Act as outlined above.

Consultation and agreement requirements for consent for mining (includes exploration and prospecting) in terrestrial reserves managed under the CALM Act (as provided for under section 24 of the Mining Act 1978)¹.

Tenure & applicable Mining Act sub-section	Minister for CALM Act concurrence	Minister for CALM Act recommendations	Conservation and Parks Commission recommendations	Parliament agreement (grant of a mining lease or general purpose lease)
Nature reserve class A Mining Act s24(3B) & s24(4)	✓	–	–	✓
National park Mining Act s24(3B) & s24(4)	✓	–	–	✓
Other class A reserve (including class A conservation park) in the 'South West' ² Mining Act s24(3B) & s24(4)	✓	–	–	✓
State forest or timber reserve in the South West Mining Act s24(6B)	✓	–	–	–
Nature reserve other than class A Mining Act s24(5B)	–	✓	✓	–
Conservation park not of class A; or Conservation park outside the South West Mining Act s24(5B)	–	✓	✓	–
Other Crown reserve not of class A or Other Crown Reserve outside South West Mining Act s24(5B)	–	✓	✓	–
State forest or timber reserve outside the Southwest Mineral Field Mining Act s24(7B)	–	✓	–	–

1 Note that this table provides indicative guidance on the provisions and operation of section 24 of the Mining Act and should not be relied upon for legal purposes.
 2 Mining Act (section 24(1)(a) refers to land that "... is in the South West Division of the State as described in Schedule 1 to the Land Administration Act 1997" or in the local government district of Esperance or Ravensthorpe. Section 24(1)(da) and 24(7B) (referred to in the last row in this table) relate to a different geographic boundary referred to as the 'Southwest Mineral Field' (Mineral Field 70) as shown in the map on the website of the Department of Mines, Industry Regulation and Safety at www.dmp.wa.gov.au/Utilities/Minerals-contacts-8328.aspx

Appendix 7 Reserve proposals

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
1	1	Moore River	17,330	FMP 1994-2003 or earlier	Other ⁴ , NP to NR
2	2	Moore River	730	Land acquisition	Other, UCL ⁴ to NR
3	3	Red Gully	130	Land acquisition	Other to NR
4	4	Red Gully	2,370	Land acquisition	Other to NR
5	5	Mindarra	1,060	Land acquisition	Other to NR
6	-	Mindarra	710	Land acquisition	Other to NR
7	6	Red Gully	730	Land acquisition	Other to NR
8	7	Boonanarring	1,220	Land acquisition	Other to NR
9	-	Moore River	10	Land acquisition	Other to NR
10	8	Moore River	40	Land acquisition	Other to NR
11	9	Moore River	950	Land acquisition	Other to NR
12	10	Beermullah	4	Land acquisition	Other to NR
13	11	Beermullah	10	Land acquisition	Other to NR
14	12	Boonanarring	890	FMP 1994-2003 or earlier	Other ⁴ , UCL ⁴ to NR
15	13	Cullalla	440	Land acquisition	Other to NR
16	-	Cullalla	1,210	Land acquisition	Other to Conservation reserve ³
17	14	Lake Muckenburra	70	FMP 1994-2003 or earlier	Other ⁴ to NR
18	15	Wilbinga	60	FMP 2014-2023	UCL to CP ²
19	16	Wilbinga	1,080	FMP 2014-2023	UCL ⁴ to CP
20	17	Caraban	2,210	FMP 1994-2003 or earlier	SF to s5(1)(h)
21	18	Caraban	3,310	FMP 1994-2003 or earlier	SF to CP
22	19	Yanchep	120	FMP 1994-2003 or earlier	SF to NR
23	20	Wabling	2,470	FMP 1994-2003 or earlier	SF, s5(1)(h) to NR
24	-	Chittering	650	Land acquisition	Other to Conservation reserve ³
25	21	Julimar	28,580	FMP 1994-2003 or earlier	SF, other to CP; Interim FCA
26	22	Julimar	30	FMP 1994-2003 or earlier	s5(1)(g) to CP
27	23	Yanchep	70	Area management plan	Other to NP
28	24	Yanchep	20	Area management plan	s5(1)(h) to NP
29	25	Ridges	2,080	FMP 1994-2003 or earlier	SF to NP
30	26	Pinjar	690	FMP 2004-2013	SF to NR
31	27	Pinjar	4,940	FMP 2004-2013	SF to s5(1)(h)
32	-	Chandala	1,130	Land acquisition	Other to Conservation reserve ³
33	28	Carabooda	90	FMP 2014-2023	Other, UCL to CP ²
34	-	Neerabup	7	Area management plan	NP to Other

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
35	29	Neerabup	7	Area management plan	Other to NP
36	30	Neerabup	20	Area management plan	Other to NP
37	31	Neerabup	20	Area management plan	Other to NP
38	32	Neerabup	40	Area management plan	Other to NP
39	33	Neerabup	480	Area management plan	Other to NP
40	-	Nowergup	20	Land acquisition	Other to Conservation reserve ³
41	34	Yongka (Melaleuca Park)	3,200	FMP 1994-2003 or earlier	SF to NR
42	35	Moondyne (Avon Valley)	5,170	FMP 1994-2003 or earlier	NR to NP
43	37	Toodyay (Avon Valley)	3,490	FMP 1994-2003 or earlier	s5(1)(h) to NP
44	38	Toodyay (Avon Valley)	1,690	FMP 1994-2003 or earlier	s5(1)(h) to NP; Interim FCA
45	39	Morangup (Avon Valley)	930	FMP 1994-2003 or earlier	NR, UCL to NP
46	-	Clackline NR	260	Land acquisition	Other to NR
47	40	Clackline NR	40	Land acquisition	Other to NR
48	-	Clackline NR	3	Land acquisition	Other to NR
49	-	Woodvale	3	Land acquisition	Other to Conservation reserve ³
50	-	Maralla Road	3	Land acquisition	Other to Conservation reserve ³
51	-	Ellen Brook	10	Land acquisition	Other to Conservation reserve ³
52	41	Bakers Hill	360	Land acquisition	Other to NR
53	42	Inkpen	40	Land acquisition	Other to NR
54	-	Herdsmen Lake	230	Area management plan	UCL ⁴ , other ⁴ to NR
55	-	Herdsmen Lake	60	Area management plan	UCL ⁴ , other ⁴ , s5(1)(h) to CP
56	44	Beelu	1,060	FMP 2014-2023	Other ⁴ , UCL to NP
57	-	Mundaring (Beelu)	10	Land acquisition	Other to Conservation reserve ³
58	45	Alfred Cove	4	Area management plan	Other to NR
59	-	Ferndale	7	Land acquisition	Other, UCL to Conservation reserve ³
60	46	Dundas Road	10	FMP 2014-2023	Other to NR
61	-	Kalamunda	40	Land acquisition	Other to Conservation reserve ³
62	47	Helena (Helena Valley)	40	RFA	SF to NP
63	48	Flynn (Helena Valley)	3,950	RFA	DWER freehold to NP
64	49	Talbot	60	RFA	Other to NR
65	50	Forrestdale Lake	150	Area management plan	Other to NR
66	51	Forrestdale Lake	110	Area management plan	Other to NR
67	53	Illawarra (Canning)	420	FMP 2004-2013	WAPC freehold to NP
68	-	Illawarra (Canning)	20	Land acquisition	WAPC freehold to NP
69	54	Dale	1,890	FMP 2014-2023	UCL to SF

FMP 2024 -2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
70	55	Russell	3,360	FMP 1994-2003 or earlier	SF to CP ²
71	part 56	Leda	8	Land acquisition	Other to s5(1)(h)
72	-	Sloan's Ridge	10	Land acquisition	Other to Conservation reserve ³
73	-	Whitby	50	Land acquisition	Other to Conservation reserve ³
74	58	Monadnocks	15,340	FMP 1994-2003 or earlier	s5(1)(g) to NP
75	59	Monadnocks	7,490	RFA	SF, DWER freehold to NP
76	60	Monadnocks	1,520	FMP 2004-2013	SF to NP
77	61	Flint	1,950	FMP 2004-2013	SF, TR to CP
78	62	Gibbs	2,260	Reinstated FMP (1994) - RFA	SF to CP
79	63	Serpentine	30	FMP 1994-2003 or earlier	CP to NP ²
80	64	Serpentine/Karnet	420	Land acquisition	Other to NP
81	65	Serpentine	40	FMP 1994-2003 or earlier	Other to NP ²
82	66	Serpentine	120	RFA	Other to NP
83	67	Serpentine	280	FMP 1994-2003 or earlier	NR, s5(1)(h) to NP ²
84	-	Goegrup Lake	10	Land acquisition	Other to Conservation reserve ³
85	68	Black Lake	2	Land acquisition	s5(1)(h) to NR
86	-	Nambeelup	90	Land acquisition	Other to Conservation reserve ³
87	69	Darling Scarp	280	RFA	SF to NR
88	70	North Dandalup	40	FMP 1994-2003 or earlier	Other to NR ²
89	71	Monadnocks	4,990	FMP 1994-2003 or earlier	SF, UCL ⁴ , s5(1)(h) to NP
90	72	Monadnocks	680	Reinstated FMP (1994) - RFA	SF to NP
91	73	Bannister	1,170	FMP 2004-2013	SF to CP
92	74	Gyngoorda	1,330	Reinstated FMP (1994) - RFA	SF to CP
93	75	Wearne	1,510	FMP 2004-2013	TR to CP
94	76	Wandering	4,310	FMP 1994-2003 or earlier	TR, other ⁴ to CP ²
95	-	Austin Bay	30	Land acquisition	Other to NR
96	-	Nirimba	40	Land acquisition	Other to Conservation reserve ³
97	-	Austin Bay	250	Land acquisition	Other to NR
98	77	Darling Scarp	160	RFA	SF to CP
99	-	Yalgorup	160	Area management plan	UCL, other to NP
100	-	McLarty	50	Land acquisition	Other to NR
101	78	McLarty	50	Land acquisition	Other to NR
102	-	Birchmont	20	Area management plan	UCL to NR
103	-	Lake McLarty	6	Land acquisition	Other to NR

FMP 2024 -2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
104	-	Kooljerrenup	8	Area management plan	Other to NR
105	-	Nine Mile Lake	100	Land acquisition	Other to NR
106	-	Lake Clifton (Yalgorup)	8	Area management plan	s5(1)(g) to NP
107	-	Yalgorup	90	Area management plan	UCL ⁴ to NP
108	79	Clifton south	560	FMP 1994-2003 or earlier	SF to NP
109	-	Preston Beach (Yalgorup)	160	Area management plan	Other to NP
110	80	McLarty	640	FMP 1994-2003 or earlier	SF to NP
111	81	Marrarup	20	RFA	UCL to NR
112	82	Lane Poole	1,730	Area management plan	CP to NP
113	84	Lane Poole	2,970	Area management plan	CP to NP
114	85	Icy Creek (Lane Poole)	180	FMP 1994-2003 or earlier	UCL to s5(1)(h) ²
115	86	Lane Poole	1,740	Area management plan	CP to NP
116	87	Myalup	680	FMP 1994-2003 or earlier	SF to NP
117	88	Myalup	210	FMP 1994-2003 or earlier	SF to NP
118	89	Cookernup	70	Land acquisition	Other to NR
119	-	Cookernup	160	Land acquisition	Other to NR
120	-	Cookernup	260	Area management plan	Other to NR
121	90	Wagerup (Yarloop)	10	FMP 1994-2003 or earlier	Other to NR
122	-	Yarloop	3	Area management plan	s5(1)(g) to NR
123	91	Lane Poole	2,560	Area management plan	CP to NP
124	92	George	550	FMP 1994-2003 or earlier	SF to NP
125	93	George	140	FMP 2004-2013	SF to NP
126	94	George	1,170	Reinstated FMP (1994) - RFA	SF to NP
127	95	Lane Poole	4,340	RFA	SF, UCL, other to CP
128	-	Yalgorup	1	Area management plan	Other to NP
129	-	Yalgorup	10	Area management plan	Other to NP
130	96	Byrd Swamp	40	Land acquisition	Other to NR
131	97	Clarke (Falls Brook)	40	FMP 2014-2023	Other to NR
132	98	Clarke (Falls Brook)	410	FMP 1994-2003 or earlier	SF to NR; Interim FCA
133	99	Clarke (Falls Brook)	200	FMP 1994-2003 or earlier	SF to NR ²
134	100	Clarke	290	Reinstated FMP (1994) - RFA	SF to NR
135	101	Lane Poole	50	FMP 2004-2013	SF to NP
136	102	Lane Poole	1,530	RFA	SF to NP
137	103	Lane Poole	38,020	FMP 1994-2003 or earlier	s5(1)(g), TR, SF, DWER freehold, other ⁴ , UCL to NP

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
138	104	Lane Poole	1,090	FMP 2004-2013	SF to NP
139	105	Stockyard/Stene (Lane Poole)	1,990	Land acquisition	Other to NR
140	106	Lane Poole	2,430	FMP 2004-2013	SF to NP
141	107	Lane Poole	3,800	FMP 2004-2013	SF, TR to NP
142	-	Leschenault Peninsula	4	Area management plan	NR to CP
143	108	Leschenault Peninsula	500	FMP 1994-2003 or earlier	Other to CP
144	-	Picton	10	Area management plan	s5(1)(h), other to NR
145	-	Gervasse (Wellington)	60	Area management plan	Other ⁴ to NP
146	-	Lennard (Wellington)	30	Area management plan	Other to NP
147	-	Wellington	70	RFA	SF to NP
148	109	Westralia (Wellington)	1,140	FMP 1994-2003 or earlier	SF to CP; Interim FCA
149	110	Westralia	310	FMP 2004-2013	SF to FCA
150	111	Batalling	400	RFA	SF to NR
151	112	Boolading	20	FMP 2014-2023	UCL ⁴ to NR ²
152	113	The Angle	930	RFA	TR to NR
153	-	North Boyanup	170	Land acquisition	Other to Conservation reserve ³
154	-	Franklandia	20	Area management plan	Other ⁴ to NR
155	114	North Boyanup Rd (Franklandia)	4	FMP 1994-2003 or earlier	Other to NR
156	115	Dardanup	140	FMP 2014-2023	SF to CP
157	116	Dardanup	120	RFA	SF to NR
158	-	Bowelling	1,090	Land acquisition	Other to Conservation reserve ³
159	117	Bennelaking	5,560	FMP 1994-2003 or earlier	SF, UCL ⁴ , other ⁴ to CP ²
160	118	Cordering	1,120	RFA	TR to NR
161	120	Stratham	9	Land acquisition	Other to NR
162	121	Boyanup	30	RFA	SF to NR
163	122	Vasse and Wonnerup Estuary	720	Area management plan	UCL, other to NR
164	123	Tuart Forest	100	FMP 1994-2003 or earlier	SF, UCL to NP
165	124	Tuart Forest	890	Area management plan	SF, other, UCL to NP
166	-	Tuart Forest	20	Land acquisition	Other to NP
167	-	Tuart Forest	1	Area management plan	s5(1)(h) to NP
168	-	Capel	60	Area management plan	Other ⁴ to NR
169	125	Whicher Scarp	4,020	FMP 2014-2023	SF, TR to NP
170	126	Ryall	910	RFA	TR, SF to FCA
171	127	Ryall	290	FMP 1994-2003 or earlier	SF to CP; Interim FCA

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
172	128	Mullalyup	540	RFA	SF, UCL ⁴ to FCA
173	129	Mullalyup	910	FMP 1994-2003 or earlier	SF to CP; Interim FCA
174	130	Harrington	690	RFA	SF to FCA
175	-	Goonac (Preston)	200	Land acquisition	Other to Conservation reserve ³
176	131	Camballan	430	FMP 1994-2003 or earlier	UCL ⁴ to CP
177	132	Camballan	6,630	Reinstated FMP(1994) - RFA	UCL ⁴ to CP
178	133	Camballan	1,520	FMP 1994-2003 or earlier	UCL ⁴ , other ⁴ to CP
179	134	Arthur River	100	Land acquisition	Other to NR
180	135	Kulikup	140	RFA	Other ⁴ to NR
181	136	Leeuwin-Naturaliste	10	Area management plan	Other to NP
182	137	Leeuwin-Naturaliste	10	FMP 1994-2003 or earlier	UCL to NP
183	138	Leeuwin-Naturaliste	7	RFA	Other to NP
184	-	Quindalup	30	Area management plan	Other ⁴ to NR
185	-	Broadwater	30	Land acquisition	Other to NR
186	139	Leeuwin-Naturaliste	5	Area management plan	UCL ⁴ to NP
187	140	Yelverton (Yelverton) (R 47672)	50	RFA	Other to NP
188	141	Yelverton NP	20	Area management plan	Other to NP
189	142	Yelverton	40	Area management plan	Other to NP
190	143	Yelverton	420	RFA	TR to FCA
191	-	Kaloorup	60	Area management plan	Other to NR
192	144	Whicher	320	RFA	SF to FCA
193	145	Mullalyup	1,260	FMP 1994-2003 or earlier	SF, s34(a) freehold to CP; Interim FCA
194	146	Golden Valley	60	FMP 1994-2003 or earlier	s34(a) freehold to FCA
195	147	Greenbushes	330	RFA	SF to FCA
196	148	Greenbushes	20	FMP 1994-2003 or earlier	s34(a) freehold to NR
197	149	Leeuwin-Naturaliste	20	Area management plan	Other to NP
198	150	Leeuwin-Naturaliste	270	Area management plan	UCL to NP
199	-	Leeuwin-Naturaliste	7	Land acquisition	Other to NP
200	-	Leeuwin-Naturaliste	20	Land acquisition	Other to NP
201	151	St John Brook	3,540	Reinstated FMP(1994) - RFA	SF, other ⁴ to CP
202	152	Jarrahwood	160	RFA	Other ⁴ to CP
203	153	Ellis Creek	130	FMP 1994-2003 or earlier	SF to CP; Interim FCA
204	154	Greenbushes	530	FMP 1994-2003 or earlier	SF to NR; Interim FCA
205	155	Hester west	1,040	FMP 1994-2003 or earlier	SF, TR to CP; Interim FCA

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
206	156	Hester south	1,470	RFA	SF, other to FCA
207	-	Mayanup	110	Land acquisition	Other to Conservation reserve ³
208	157	Leeuwin-Naturaliste	9	Area management plan	Other to NP
209	158	Leeuwin-Naturaliste	20	Area management plan	UCL ⁴ , other to NP
210	159	Bramley	10	Area management plan	TR, UCL to NP
211	160	Bramley (R 47956)	30	RFA	Other to NP
212	161	Bramley	250	RFA	TR to FCA
213	162	Bramley (R 47956)	10	RFA	Other to NP
214	163	Bramley	5	Area management plan	Other to NP
215	164	Bramley (R 47956)	2	RFA	Other to NP
216	165	Mowen	980	Reinstated FMP (1994) - RFA	SF to NR
217	166	Butler (Butler)	1,250	FMP 2004-2013	SF to FCA (Ministerial condition)
218	167	Dalgarup	950	FMP 1994-2003 or earlier	SF to NR; Interim FCA
219	168	Nelson	620	RFA	SF to FCA
220	169	Dalgarup	200	Land acquisition	Other to NP
221	170	Glenlynn	1,390	RFA	TR, SF, other ⁴ to FCA
222	171	Kingston (Greater Kingston)	10	FMP 2004-2013	SF to NP
223	172	Wournbelup/ Chowerup	2,170	RFA	UCL ⁴ , other to NR
224	173	Wournbelup	600	FMP 1994-2003 or earlier	UCL ⁴ to SF
225	174	Chowerup	710	FMP 1994-2003 or earlier	Other ⁴ , UCL ⁴ to SF ⁵
226	175	Leeuwin-Naturaliste	8	Area management plan	Other to NP
227	176	Leeuwin-Naturaliste	20	Area management plan	Other to NP
228	-	Redgate	4	Land acquisition	Other to Conservation reserve ³
229	177	Witchcliffe	1,060	FMP 1994-2003 or earlier	UCL ⁴ , other to SF
230	178	Witchcliffe	490	FMP 2004-2013	UCL ⁴ to NP
231	179	Forest Grove	30	Area management plan	UCL, other to NP
232	180	Forest Grove	130	Area management plan	Other to NP
233	181	Blackwood River	200	Land acquisition	Other to NP
234	182	Beaton	440	FMP 1994-2003 or earlier	TR to CP; Interim FCA
235	-	Beaton	200	Land acquisition	Other to Conservation reserve ³
236	183	Leeuwin-Naturaliste	310	FMP 1994-2003 or earlier	Other ⁴ to NP
237	184	Leeuwin-Naturaliste	490	Area management plan	UCL ⁴ to NP
238	185	Leeuwin-Naturaliste	70	Area management plan	Other to NP
239	186	Scott River	8	Area management plan	Other to NP

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
240	187	Beerup	150	Land acquisition	Other to NR
241	188	Hilliger	9,050	RFA	SF, UCL ⁴ , other ⁴ to FCA
242	189	Easter	60	FMP 2014-2023	SF to FCA
243	190	One Tree Bridge	670	FMP 1994-2003 or earlier	SF, s34(a) freehold, UCL, other ⁴ , s5(1)(g) to CP; Interim FCA
244	191	Lewin	50	FMP 1994-2003 or earlier	UCL ⁴ , other ⁴ to SF
245	192	Solai	160	FMP 1994-2003 or earlier	TR, other ⁴ , UCL ⁴ to SF
246	193	King Jarrah	200	FMP 1994-2003 or earlier	s5(1)(h) to SF
247	194	Dingup	230	FMP 1994-2003 or earlier	SF to CP; Interim FCA
248	195	Weinup	80	RFA	Other to NR
249	196	Bolbelup	1,500	RFA	UCL ⁴ , TR to FCA
250	197	Bolbelup	40	FMP 1994-2003 or earlier	Other to SF
251	198	Leeuwin-Naturaliste	40	Area management plan	Other to NP
252	199	Leeuwin-Naturaliste	230	Land acquisition	Other to NP
253	200	Leeuwin-Naturaliste	40	Area management plan	Other to NP
254	201	Hardey Inlet	110	Draft area management plan	NP to NR
255	202	Hardey Inlet	8	Area management plan	Other ⁴ to NR
256	203	Hardey Inlet	3	Area management plan	UCL ⁴ to NR
257	204	Augusta	70	Area management plan	UCL to CP
258	205	Hardey Inlet	200	Area management plan	Other ⁴ , UCL ⁴ to NR
259	206	Hardey Inlet	110	Area management plan	Other, UCL to NR
260	207	Scott River	110	Area management plan	Other, UCL to NP
261	-	Scott River	140	Land acquisition	Other to Conservation reserve ³
262	208	Gingilup Swamps	100	Area management plan	UCL to NR
263	209	Gingilup Swamps	440	Area management plan	UCL ⁴ to NR
264	210	Gingilup Swamps	10	Area management plan	Other to NR
265	211	Gingilup Swamps	120	Area management plan	Other ⁴ to NR
266	212	Central (D'Entrecasteaux)	600	FMP 2004-2013	SF to NP
267	214	Strickland (Beedelup)	180	FMP 2014-2023	Other ⁴ , UCL, SF to NP
268	215	Sir James Mitchell NP	180	FMP 1994-2003 or earlier	NP to SF ⁵
269	216	Talling (Tone-Perup)	40	FMP 1994-2003 or earlier	Other to NR
270	217	Perup	4,030	Area management plan	Other to Conservation reserve ³
271	218	Bokarup	490	FMP 1994-2003 or earlier	Other ⁴ , UCL ⁴ to NR
272	219	Quannup (D'Entrecasteaux)	4,460	FMP 1994-2003 or earlier	UCL ⁴ to NP
273	220	Nairn	60	FMP 1994-2003 or earlier	UCL ⁴ to SF

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
274	221	Quindinup (Bolbelup)	110	Land acquisition	Other to NR
275	222	Talling (Lake Muir)	620	FMP 2014-2023	UCL ⁴ to NR
276	223	Chitelup (Lake Muir)	310	FMP 2004-2013	SF to NR
277	224	Perillup	130	RFA	NR to FCA
278	225	Kwornicup Lake	10	FMP 1994-2003 or earlier	Other to NR
279	226	Northcliffe	20	FMP 1994-2003 or earlier	UCL ⁴ to SF
280	227	Pardelup	3,670	RFA	SF, TR, other, UCL to FCA
281	228	Mt Barker	260	RFA	Other, leasehold (Aboriginal) to FCA
282	229	Mt Barker	50	RFA	Other ⁴ , UCL ⁴ to FCA
283	230	Northcliffe	40	FMP 1994-2003 or earlier	UCL to SF
284	231	Northcliffe	60	FMP 1994-2003 or earlier	UCL ⁴ to SF
285	232	Gardner	560	FMP 1994-2003 or earlier	UCL to SF
286	233	Wye-Deep	3,030	FMP 2004-2013	SF to FCA
287	234	Denbarker	230	FMP 2004-2013	UCL ⁴ , other ⁴ to FCA
288	235	D'Entrecasteaux	1,010	FMP 1994-2003 or earlier	SF to NP
289	236	Dawson	400	FMP 2004-2013	SF to FCA
290	237	Dawson	70	FMP 2004-2013	SF, other ⁴ to FCA
291	238	Dawson	530	FMP 2004-2013	SF to FCA
292	239	Crown res 14325 (Walpole-Nornalup)	80	FMP 2004-2013	Other ⁴ to NP
293	240	Walpole-Nornalup	40	Land acquisition	Other to NP
294	241	Keystone-Swarbrick	960	FMP 2004-2013	Other, SF to FCA
295	242	Swarbrick	260	FMP 2004-2013	SF to FCA
296	243	Walpole Townsite (Walpole-Nornalup)	60	FMP 2004-2013	UCL ⁴ to NP
297	244	Swarbrick (Walpole-Nornalup)	200	RFA	SF to NP
298	245	Collis	310	FMP 2004-2013	SF, s5(1)(g), UCL to FCA
299	246	Collis	170	FMP 2004-2013	SF to FCA
300	247	Collis	1,120	FMP 2004-2013	SF, s5(1)(g) to FCA
301	248	Walpole-Nornalup	10	Land acquisition	Other to NP
302	249	Trent	100	FMP 2004-2013	TR to FCA
303	250	Bow River	270	FMP 2004-2013	SF to FCA
304	251	Bow River	360	FMP 2004-2013	SF, other ⁴ , UCL to FCA
305	252	Kent River	100	Area management plan	UCL ⁴ to NR
306	253	Thames	320	FMP 2004-2013	TR to FCA
307	254	Styx	20	FMP 1994-2003 or earlier	Other ⁴ to SF
308	255	Styx	4,420	FMP 2004-2013	Other ⁴ , SF ⁴ to FCA

FMP 2024-2033 ID	FMP 2014-2023 ID	Locality name	Area (ha) ¹	Source	Proposal type
309	256	Thames	60	FMP 2004-2013	Other ⁴ to FCA
310	257	Harewood	3,200	FMP 2004-2013	SF ⁴ , TR, other ⁴ to FCA
311	258	Denmark River	50	FMP 2004-2013	SF ⁴ to FCA
312	259	Harewood	110	FMP 2004-2013	SF ⁴ to FCA
313	260	Harewood south east	110	FMP 2004-2013	SF to FCA
314	261	Crown res 15623	60	FMP 2004-2013	s5(1)(g) to FCA
315	262	Hay	690	FMP 2004-2013	SF ⁴ , UCL ⁴ to FCA
316	263	Hay	910	FMP 2004-2013	TR to FCA
317	264	Redmond	70	FMP 2014-2023	UCL ⁴ to SF
318	265	Redmond	1,210	RFA	TR to NR
319	-	Indicative areas for new reserves	535,760 ⁶	FMP proposal	SF, TR to Conservation reserve

Note: The proposed reserves cover a range of tenures from freehold to unallocated Crown land. Where possible, the department will manage the areas vested in the Conservation and Parks Commission consistent with their intended future purpose and relevant department policies, until they have been formally reclassified as proposed by this plan. Activity in other tenures not vested in the Commission is not necessarily affected by the proposals, until they take effect.

- CP:** Conservation park
- DWER:** Department of Water and Environmental Regulation
- FCA:** Forest conservation area. An FCA is SF classified as such through Section 62(1) of the CALM Act
- SF:** State forest
- NP:** National park
- NR:** Nature reserve
- Other:** Crown reserve or freehold land not vested in the Commission
- s5(1)(g):** CALM Act Section 5(1)(g) – land vested under the *Land Act 1933*
- s5(1)(h):** CALM Act Section 5(1)(h) – land vested under the *Land Administration Act 1997*
- s34(a) freehold:** CALM Act Section 34(a) freehold – land held by the CALM Executive Body
- TR:** Timber reserve
- UCL:** Unallocated Crown land
- WAPC:** Western Australian Planning Commission

¹ areas greater than 10 hectares have been rounded to the nearest 10 hectares
² provided for in *Reserves (National Parks, Conservation Parks, Nature Reserves and Other Reserves) Act 2004*
³ while the department prefers these parcels of land to become conservation reserve, the specific proposed tenure and class will be subject to government consideration and determination.
⁴ in consideration for the Noongar Land Base
⁵ part of the proposed State forest area is included in the indicative areas for increased protection
⁶ a subset of this area will be identified to contribute to the 400,000 hectares of additional reservation announced by the State Government in 2021

Appendix 8 Percentage reservation levels¹ of forest ecosystems

Forest Ecosystem (as of December 2022)	Land Categories (as of June 2022)								
	Conservation Reserves		State Forest and Timber Reserves		Total Area Reserved (existing and proposed conservation reserves and DAZ)		Indicative areas for new reserves ^{2,3} (hectares)	Other (remaining State forest/ timber reserve/ section 5(1) (h) forestry reserve) (hectares)	Total Area (hectares)
	Gazetted (hectares)	FMP Proposed (hectares)	Disturbance Avoidance Zones (DAZ) (hectares) (as of December 2022)		hectares	%			
			Outside indicative areas for new reserves	Inside indicative areas for new reserves					
Jarrah dominant									
Jarrah Forest - Blackwood Plateau	72,350	14,660	960	20,310	108,270	42%	156,660	10,190	254,820
Jarrah Forest - Dandaragan Plateau	1,480	2,090	0	0	3,570	100%	0	0	3,570
Jarrah Forest - Leeuwin Ridge	7,670	730	850	0	9,260	100%	0	0	9,260
Jarrah Forest - Mt Lindesay	18,690	5,070	50	460	24,270	89%	3,380	80	27,270
Jarrah Forest - North East	30,750	70,870	15,220	1,260	118,100	48%	9,410	118,100	244,360
Jarrah Forest - North West	62,470	39,070	35,870	5,950	143,370	33%	42,660	253,930	434,000
Jarrah Forest - Sandy Basins	10,910	11,420	2,440	1,370	26,130	43%	17,360	19,090	61,220
Jarrah Forest - South	215,420	10,930	5,540	30,930	262,810	64%	163,510	14,030	409,420
Jarrah Forest - Swan Coastal Plain	3,930	2,270	560	90	6,830	100%	90	0	6,830
Jarrah Forest - Unicup	14,490	3,610	20	0	18,120	100%	0	0	18,120
Jarrah Forest/Rates Tingle	1,160	0	0	0	1,160	100%	0	0	1,160
Jarrah Forest/Red Tingle	220	0	0	0	220	100%	0	0	220
Jarrah Forest/Yellow Tingle	7,590	700	0	0	8,290	100%	0	0	8,290
Jarrah woodland	44,200	25,070	34,420	16,590	120,280	97%	18,120	2,060	123,860
Sub-total	491,300	186,490	95,940	76,950	850,680		411,190	417,480	1,602,400
Karri dominant									
Karri - Main Belt	69,740	2,120	530	21,380	93,770	61%	79,860	1,220	153,470
Karri - South Coast	890	240	0	20	1,140	93%	100	0	1,220
Karri - West Coast	4,170	440	10	0	4,630	99%	10	40	4,670
Karri/Rates Tingle	790	0	0	0	790	100%	0	0	790
Karri/Red Tingle	5,130	80	0	0	5,210	100%	0	0	5,210
Karri/Yellow Tingle	11,190	550	0	0	11,740	100%	0	0	11,740
Sub-total	91,900	3,440	540	21,400	117,280		79,960	1,260	177,110
Wandoo dominant									
Western Wandoo forest	41,040	24,900	6,830	1,210	73,980	75%	4,650	21,320	98,740
Western Wandoo woodland	18,290	15,430	2,750	510	36,970	83%	3,240	4,860	44,570
Sub-total	59,330	40,320	9,580	1,720	110,950		7,890	26,190	143,310
Other									
Banksia woodland	18,450	35,750	0	0	54,200	76%	12,650	4,900	71,750
Bullich and Yate	1,630	680	150	0	2,460	92%	20	190	2,670
Darling Scarp	3,080	770	180	140	4,170	100%	140	0	4,170
Peppermint and coastal heathland	69,760	7,590	0	150	77,500	99%	260	770	78,380
Rocky outcrops	7,560	2,270	4,110	170	14,110	100%	170	0	14,110
Sand dunes	12,510	470	0	0	12,980	100%	0	0	12,980
Shrub, herb and sedgeland	220,820	23,330	10,440	19,350	273,930	100%	19,540	500	274,630
Swamps	8,110	1,970	340	90	10,500	98%	100	210	10,720
Tuart	7,050	2,970	600	140	10,750	100%	140	0	10,750
Whicher Scarp	670	2,810	280	490	4,250	74%	1,590	360	5,710
Sub-total	349,620	78,620	16,100	20,520	464,860	96%	34,600	6,930	485,870
Total⁴	992,150	308,870	122,160	120,590	1,543,760		533,630	451,860	2,408,670

Notes:

1. The area reserved includes existing and proposed conservation reserves and disturbance avoidance zones expressed as a percentage of the total area of each forest ecosystem on lands vested in the Commission. This appendix shows the extent of mapped ecosystems. It does not show the total of each tenure category which may also include reservoirs, exotic species, and cleared land.
2. A subset of the 'Indicative areas for new reserves' will be identified to contribute to the 400,000 hectares of additional reservation announced by the State Government in 2021.
3. Area includes Disturbance Avoidance Zones inside investigation areas.
4. Totals of rows and columns within the table may not be consistent due to rounding.

Appendix 9 Conservation reserve design

The creation of a new conservation reserve involves several stages and is a lengthy process.

A subset of areas has been identified as a priority for investigation for reserve creation, and these are also depicted on Map 13. These priority areas were selected based on reserve design principles as a starting point for stakeholder consultation and subsequent detailed boundary design. This selection was based on consideration of:

- the presence of biodiversity values, including old-growth forest; less-well reserved vegetation complexes; threatened species and ecological communities; centres of endemic, disjunct or relictual flora
- the current and likely future condition of vegetation, including presence or extent of *Phytophthora* dieback
- enhancing connectivity across landscapes to existing reserves, including through consolidation of areas previously identified as fauna habitat zones
- disturbance history, with areas of recent timber harvest or firewood collection areas being avoided; and
- alignment where practicable with existing management boundaries such as the strategic road network.

The combined total area identified for priority consideration is approximately 120,000 hectares or 30 percent of the initial expansion target.

The next steps in the design phase for each area will involve consultation with respective Noongar Regional Corporations and stakeholders, and further detailed boundary feasibility review by departmental personnel.

The final creation for all areas of new conservation reserves will then be progressed through the administrative steps necessary for creation of the reserve. This involves multiple steps, including:

- Consultation with other government agencies including the Department of Planning, Lands and Heritage (DPLH) local government authorities, Department of Mines, Industry Regulation and Safety, the Forest Products Commission and other interested parties.
- Completion of survey work and preparation of Deposited Plans (showing features such as boundaries, easements and roads).
- Seeking endorsement from the Commission and approval from the Minister for Environment for changes in tenure.
- Under the CALM Act the areas of State forest or timber reserve proposed to become new conservation reserves are removed from the forest estate. This may include tabling to Parliament.
- Concurrently DPLH will prepare documents to create the new reserves; reserve creation is finalised by DPLH once the lands are no longer State forest or timber reserves.

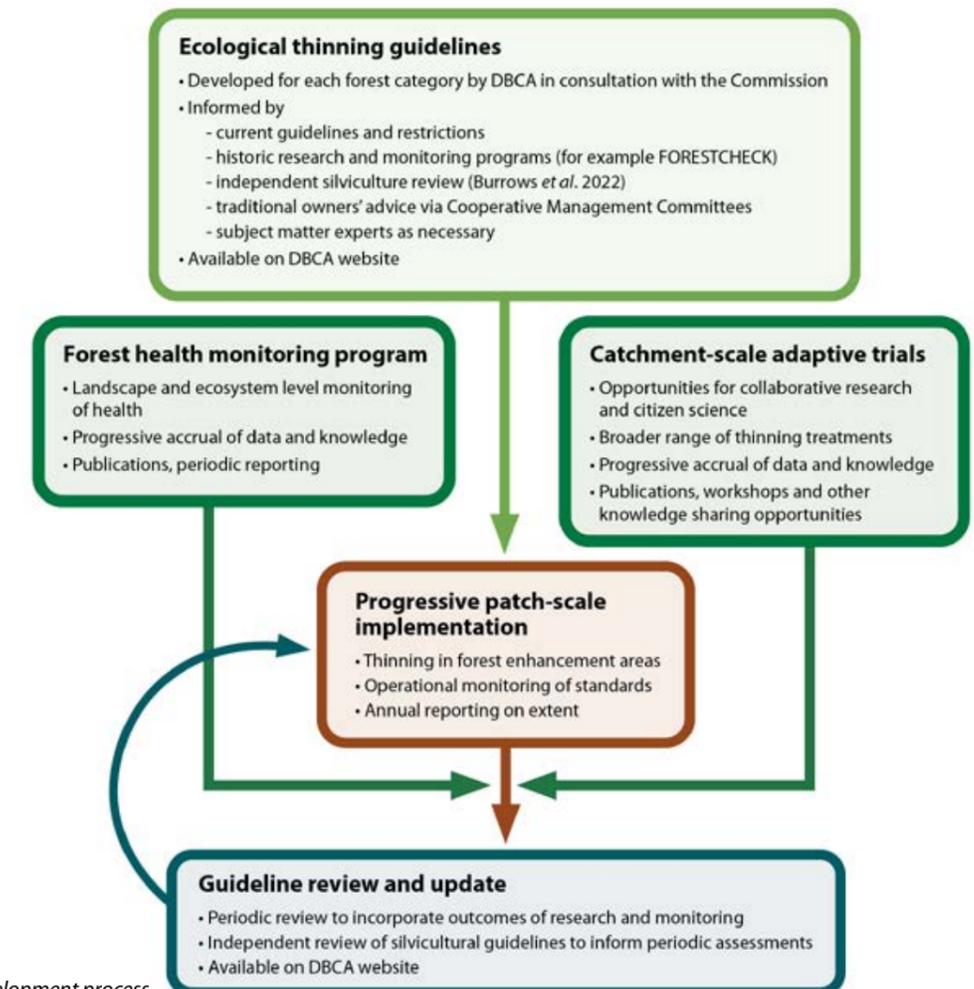
Appendix 10 Process for preparation of silvicultural guidelines for ecological thinning

The development of new silvicultural guidance for ecological thinning and translation into operational procedures will be prioritised by DBCA.

Current silvicultural guidelines, procedures and monitoring approaches for thinning activities have been informed by decades of experimental research on forest hydrology and stand growth responses to variations in stand stocking density. As Burrows *et al.* (2022) note, these guidelines provide a solid basis to inform ecological thinning approaches, while the extensive areas of thinned forest within the Plan area (across many combinations of age, species and site) provide further insight into outcomes of silvicultural practices. Nonetheless, the new focus on promoting long-term forest health and resilience and biodiversity conservation outcomes will require new, separate guidelines be developed for each forest category (mining rehabilitation, regrowth jarrah and regrowth karri), which reflect the different species biology, stand dynamics, forest ecosystem responses to disturbance, and potential forest health vulnerabilities. Uncertainty in species tolerance of future drying and warming conditions and responses to extreme weather events may also require novel approaches (Breshears *et al.* 2021) so guidelines will continue to evolve as field outcomes are reviewed and results of monitoring and adaptive trials accrue.

Given the imperative to address climate challenges through ecological thinning, guidelines developed by DBCA in consultation with the Commission (with input from other subject matter experts as necessary) will guide initial operations. These guidelines will be informed by the recent summary of the impact of silvicultural practices on biodiversity (DBCA 2021). As resources permit, opportunities for collaborative research and other stakeholder engagement will accompany the establishment of the catchment-level experiments which will seek to examine a range of treatment options.

Guidelines will be made publicly available and scientific knowledge gained through research and trials will be published or made publicly available through reporting mechanisms such as departmental annual reports, technical reports and seminars or workshops.



Silviculture guideline development process

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Acronyms

BC Act	<i>Biodiversity Conservation Act 2016</i>
BRM	Basic raw materials
BOM	Bureau of Meteorology
CALM Act	<i>Conservation and Land Management Act 1984</i>
CAR	Comprehensive, adequate and representative – as applied to the conservation reserve system
CMA	Cooperative Management Agreement
CMC	Cooperative Management Committee
DAS	Disturbance Approval System
DBCA	Department of Biodiversity Conservation and Attractions
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986</i>
ESFM	Ecologically sustainable forest management
FCA	Forest Conservation Area
FM regulations	Forest Management Regulations 1993
FMP	Forest Management Plan
FP Act	<i>Forest Products Act 2000</i>
FPC	Forest Products Commission
ILUA	Indigenous land use agreement
IPCC	Intergovernmental Panel on Climate Change
JMA	Joint Management Agreement
JMB	Joint Management Body
KPI	Key performance indicator
NRC	Noongar Regional Corporation
PECs	Priority ecological communities
PGER Act	<i>Petroleum and Geothermal Energy Resources Act 1967</i>
PDWSA	Public drinking water source area
RFA	Regional forest agreement
RIWI Act	<i>Rights in Water and Irrigation Act 1914</i>
SWALSC	South West Aboriginal Land and Sea Council
TECs	Threatened ecological communities
WA RFA	Regional Forest Agreement for the South-West Forest Region of Western Australia

Noongar Glossary

Ballardong	Refers to one of the Noongar language or dialectal groups encompassing the towns of Northam, York, Quairading, Koorda, and Tammin. Ballardong is both a single dialectal group (traditional boundary) and also the name of the ILUA or agreement area (Native Title Boundary) which encompasses a number of dialectal groups.
Ballawara	Brush-tailed phascogale (<i>Phascogale tapoatafa wambenger</i>)
Birak	One of the Noongar six seasons - December and January, the first summer bonar (season)
Bonar	Noongar word for season
Boodjar	Noongar land/country
Boonaroo/Bunuru	One of the Noongar six seasons – February and March, the second summer
Djarilmari	Forest
Djeran	One of the Noongar six seasons – April and May, the cooler weather begins
Djilba	One of the Noongar six seasons – August and September, the second rains
Gnaala Karla Booja	Refers to one of the six ILUAs that make up the South West Native Title Settlement encompassing the towns of Capel, Donnybrook, Balingup, Wickepin, Narrogin, Williams, Mundijong, Kwinana, Brookton, Pingelly, Wagin, Harvey, Collie, Pinjarra, Mandurah and Boddington
Kaarak	Forest red-tailed black cockatoo (<i>Calyptorhynchus banksii naso</i>)
Karri karak (formerly South West Boojarah)	Refers to one of the six ILUAs that make up the South West Native Title Settlement encompassing the towns of Busselton, Margaret River, Witchcliffe, Augusta, Windy Harbour, Northcliffe, Pemberton, Manjimup, Bridgetown and Nannup
Kadidjiny	Know, thinking, listening, learning, understanding
Kambarang	One of the Noongar six seasons – October and November, the longer dry periods
Koomal	Common brushtail possum (<i>Trichosurus vulpecula</i>)
Koora	Long ago, before, in the past
Kwenda	Southern brown bandicoot (<i>Isodon fusciventer</i>)
Kwer	Western brush wallaby (<i>Notamacropus</i>)
Maaman	Man, men or father
Mookaroo/Makuru	One of the Noongar six seasons – June and July, the first rains and the coldest season
Ngooritj	Water rat (<i>Hydromys chrysogaster</i> – rakali)
Ngamar	A rock-hole
Ngoolboogoor	Honey possum (<i>Tarsipes rostratus</i>)
Ngoolyak	Carnaby's white-tailed black cockatoo (<i>Zanda latirostris</i>)
Ngoolyanak	Baudin's white-tailed black cockatoo (<i>Zanda latirostris</i>)
Ngwayir	Western ringtail possum (<i>Pseudocheirus occidentalis</i>)
Noongar Elder	The custodians of Aboriginal knowledge chosen by their communities. Highly respected keepers of the knowledge and pass that knowledge on to younger Aboriginal people.
Nyidiny	Dreaming means 'cold', 'cold times', or 'ancestral times'. The Noongar people know it as the Creation time, the time before time when spirits rose from the earth and descended from the sky to create the land forms and all living things.
Tjooditj	Western quoll or chuditch (<i>Dasyurus geoffroi</i>)

Wagyl Kaip and Southern Noongar	Refers to one of the six ILUAs that make up the South West native Title Settlement encompassing the towns of Katanning, Gnowangerup and Albany and includes the Stirling Ranges
Wakarl	Soul, spirit or breath. The Wakarl is the major spirit for Noongar people and central to Noongar beliefs and customs. The Wakarl is a snake or rainbow serpent recognised by Noongar people as the giver of life, maintaining all fresh water sources. The Wakarl made Noongar people the custodians of the land.
Whadjuk	Refers to the dialectal group from the Perth area and one of the six ILUAs that make up the South West Native Title Settlement encompassing the towns of Perth, Fremantle, Joondalup, Armadale, Toodyay, Wundowie, Bullsbrook and Chidlow.
Walyo also called Woylie	Brush-tailed bettong (<i>Bettongia penicillata oglebyi</i>)
Yeyi	Present (now)
Yongka	Kangaroo (Western grey kangaroo – <i>Macropus fuliginosus</i>)
Yok	Young girl (maaman and yok – men and women)
Yued	Refers to one of the Noongar language or dialectal groups and one of the six ILUAs that make up the South West Native Title Settlement encompassing the towns of Leeman, Jurien Bay, Cervantes, Two Rocks, Gingin, Calingiri, Dalwallinu, Coorow and Moora.

Glossary

Adaptive management	The term adaptive management refers to an approach to managing complex natural systems under conditions of ongoing uncertainty that builds on common sense and learning from experience, experimenting, monitoring, and adjusting practices based on what was learned. Adaptive management strategies can support managers and planners overcome the inherent uncertainty surrounding climate change, its effects, and appropriate responses. Adaptive management has been defined by the British Columbia Ministry of Forests (2004) as: "Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs".
Australian Carbon Credit Units	An Australian-based carbon credit that can be created as a result of activities that avoid or remove greenhouse gas emissions. Each ACCU is representative of one tonne of carbon dioxide having been removed, or avoided, by the eligible activity.
Apiculture	The activities, products and services associated with beekeeping carried out by beekeepers. Including but not limited to pollination services of agricultural crops, and production of honey, beeswax, pollen, propolis, royal jelly, bee venom, queen breeding, live bee packages and nucleus colonies.
Basic raw materials	Materials such as gravel, shale, clay, sand, limestone and rock used principally for road construction and building purposes.
Best practice	Best practices are the working standards or ethical guidelines that provide the best course(s) of action in a given situation.
Biological diversity (Biodiversity) (described in <i>Biodiversity Conservation Act 2016</i>)	The variability among living biological entities and the ecosystems and ecological complexes of which those entities are a part and includes: (a) diversity within native species and between native species (b) diversity of ecosystems; and (c) diversity of other biodiversity components.
Burl	A rounded knotty growth on a tree containing twisted, compact wood highly valued for figurative woodwork.
Burn Options program	Statewide approved prescribed burn options available to the department to implement its prescribed burning program.
Catchment	The land area drained by a single stream, river, or drainage network.
Carbon farming	An approach aimed at sequestering atmospheric carbon into plant material with the aim to limit global carbon emissions and store CO ₂ from the atmosphere and into the plants of productive landscapes.
Carbon dioxide (CO₂) equivalents	A carbon dioxide equivalent (CO ₂ -eq) is a metric measure used to compare the emissions from various greenhouse gases on the basis of their global-warming potential (GWP), by converting amounts of gases to the equivalent amount of carbon dioxide with the same GWP.
Carbon sequestration	Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide. It is one method of reducing the amount of carbon dioxide in the atmosphere with the goal of reducing global climate change.
Clearfell	A silvicultural method in which all, or nearly all, trees in a defined area are removed at one time to allow regeneration to establish and develop (note legacy elements are marked for retention, and some non-commercial trees may still remain on site).
Climate resilience	The ability to prepare for, recover from and adapt to impacts of climate change.
Coarse woody debris	Dead woody material such as tree trunks and branches on the ground or in streams.
Completion criteria	Objectively defined criteria (agreed by the State and each proponent) used to evaluate whether areas disturbed by mining and associated operations on CALM Act lands have been returned to an acceptable state for relinquishment by the mining company and resumption of control and management, consistent with the reserved lands purpose, by the department on behalf of the Western Australian Government.
Conserve	The CALM Act states: "conserve includes to maintain and to restore".
Conservation reserve	An area set aside primarily for the conservation of natural ecosystems, but which may allow a level of recreation or other uses consistent with the proper maintenance and restoration of the natural environment.
Coupe	An area of forest that is planned for harvest and silvicultural treatments as a single unit.
Criterion	A category, condition or processes by which sustainable forest management may be assessed.
Critically endangered	A taxon is critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.

Crown (tree)	Also known as canopy, it is the leaves and branches extending from the bole (stem) of a tree.	Forest block	A named administrative subdivision of the forest, varying in size from about 3,000 to 8,000 hectares.
Cutover	An area that has previously been harvested.	FORESTCHECK	An integrated monitoring project, designed to provide information to forest managers about changes in trends in biodiversity associated with forest activities, that was implemented under FMP 2004-2013 and FMP 2014-2023.
Dieback (Phytophthora dieback)	In the south-west of Western Australia, a disease of plants caused by infection by the soil-borne organisms of the genus <i>Phytophthora</i> , of which <i>P. cinnamomi</i> is the most widespread.	Forest ecosystem	An indigenous ecosystem with an overstorey of trees of more than 20 percent crown cover, incorporating all living and non-living components of the area. This includes Australia's diverse native forests and plantations, regardless of age. It is also sufficiently broad to encompass areas of trees that are sometimes described as woodlands.
Disease Risk Area	Forest Disease Risk Areas are administrative boundaries which delineate areas of forest/vegetation subject to the risk of infection from <i>Phytophthora</i> dieback – a highly contagious fungal disease. Strict quarantine and access restrictions apply to these areas.	Forest enhancement area	An area within which ecological thinning activities are planned and undertaken. The spatial extent of a Forest Enhancement Area may for practical purposes encompass Disturbance Avoidance Zones or other patches where thinning is not to be undertaken, but which form part of a logical planning unit.
Disturbance	Any relatively discrete event in time that disrupts ecosystems, communities, or population structure and changes resource availability or the physical environment. Disturbance may be natural (e.g., lightning-caused fire) or human induced (e.g., roads, tracks or trails).	Forest health	For this plan, a healthy native forest is one that continues to sustain the natural ecosystem components, including biodiversity and biophysical, ecological and evolutionary processes. Ecosystem components are not static, but interact at varying scales and rates over time. Where forests are subject to disturbance, whether natural or human, their resilience can be described as their capacity to maintain or regain a healthy condition over time.
Disturbance activities	Planned disturbance activities which are approved under the DAS and unplanned disturbance activities which refers to disturbance resulting from unauthorised activities such as illegal firewood collection, driving vehicles offroad and illegal dumping.	Forest produce	For the purposes of the CALM Act, 'forest produce' includes trees, parts of trees, timber, sawdust, chips, firewood, charcoal, gum, kino, resin, sap, honey, seed, bees-wax, rocks, stone and soil but, subject to the foregoing, does not in Division 1 of Part VIII include minerals within the meaning of the Mining Act.
Disturbance Approval System (DAS)	Computer application used by DBCA to assess and, as appropriate approve, disturbance activities on DBCA-managed lands.	Forest products	As for the purposes of both the CALM Act and the Forest Products Act: trees or parts of trees; timber, sawdust or chips; charcoal, gum, resin, kino or sap; and firewood, located on public land, share-farmed land, or freehold land acquired as described in section 10(3)(fa) of the Forest Products Act.
Disturbance Avoidance Zone	Areas within State forest and timber reserves where planned disturbance activities are to be avoided or minimised. The term combines the various types of informal reserves described in Appendix 1c.	Formal reserve	One of the land category categories of national park, nature reserve, conservation park, or CALM Act sections 5(1)(g) or 5(1)(h) reserves for the purpose of conservation.
Dreaming	Dreaming (nyidiny) means 'cold', 'cold times', or 'ancestral times'. The Noongar people know it as the Creation time, the time before time when spirits rose from the earth and descended from the sky to create the landforms and all living things.	Global carbon cycles	The global carbon cycle refers to the exchanges of carbon within and between four major reservoirs: the atmosphere, the oceans, land and fossil fuels.
Ecologically sustainable forest management (ESFM)	Forest management and use consistent with the principles described in section 19(2) of the CALM Act.	Guideline	A document type that guides and directs actions for achieving consistency and required standards. Guidelines permit some flexibility in their application.
Ecological thinning	Ecological thinning is an active forest management tool that involves the selective removal of individual trees to improve or maintain ecological value and reduce current and future moisture stress of a given area.	Habitat	A component of an ecosystem providing food and shelter to a particular organism.
Ecosystem	A dynamic complex of ecological communities and the non-living chemical and physical parts of their environment interacting as a functional unit.	Headwater catchment	A headwater catchment is the area of land and groundwater that contributes to the first expression of streamflow, often intermittent or ephemeral, in a creek, brook or other small stream.
Endangered	A taxon is endangered when it is not critically endangered but is facing a very high risk of extinction in the near future.	Heritage	Something inherited from past generations that is valued.
Endemic	Flora or fauna that is confined in its natural occurrence to a particular region.	Heterogeneity	The quality or state of being diverse in character or content. In this plan stand heterogeneity is defined as diversity with respect to stand structure.
Ex-situ	Off site.	High salt risk	Refers to certain river systems within the historic intermediate rainfall zone (based on data up to 1978) that are least disturbed and as such, presumed to have the most intact aquatic ecosystems and consequently are the most environmentally sensitive to rises in saline groundwater.
Exotic species	Any species growing or living outside its natural range of occurrence. This commonly refers to species purposely or accidentally introduced into countries or regions where they do not historically occur.	Hydrogeology	The area of geology that deals with the distribution and movement of groundwater in the soil and rocks of the earth's crust (commonly in aquifers).
Fauna	As defined in the BC Act, the animals inhabiting and area: including mammals, birds, reptiles, amphibians and invertebrates. Usually restricted to animals occurring naturally and excluding feral or introduced animals	Hygiene (in relation to dieback)	The set of practices to be followed to maintain native vegetation health through protection from human and vehicle-vectored spread of soil-borne <i>Phytophthora</i> species.
Fauna habitat zone	Patches of forest systematically distributed across the landscape which are temporarily excluded from disturbance.	Indigenous flora and fauna	Refers to a plant (flora) or animal (fauna) which occurs naturally in a given geographical area. That animal and plant also occurs in other areas nearby or elsewhere in the state or country. Differs from endemic (a plant or animal that only occurs in a specific geographical area and nowhere else).
Feral animal	An introduced or domestic animal now living in the wild.	In situ	In the original place.
Fire regime	The typical range of variation in the interval, severity (or intensity), and season of fire, together with relevant spatial attributes (e.g., extent, boundary shape, patchiness, heterogeneity in severity), and the interactions among these elements – that occurs at a point, or across a landscape.	Informal reserve	See Disturbance Avoidance Zone.
Flora	As defined in the BC Act, the plants growing in an area; including flowering and nonflowering plants, ferns, mosses, lichens, algae and fungi.	Indicator	A measure (measurement) of an aspect of a criterion. A quantitative or qualitative variable that can be measured or described and that, when observed periodically, may demonstrate trends.
Floristic	Of or relating to flowers, a flora, or the biogeographical study of plants.	Integrated monitoring	For the purpose of this plan, integrated monitoring is defined as a systematic integration of data and knowledge across policy, management and science to monitor, analyse and report on the effectiveness of management in achieving FMP objectives.
Forest	An area, incorporating all living and non-living components, that is dominated by trees having usually a single stem and a mature or potentially mature stand height exceeding two metres and with existing or potential crown cover of overstorey strata about equal to or greater than 20 percent.		

Integrated Water Supply Scheme	The largest scheme managed by the Water Corporation combining desalinated seawater, groundwater, dams, and groundwater replenishment water sources supplying Perth, the Goldfields, Agricultural region and part of the South West.	Patch	A group of trees resulting from a natural regeneration event or a past forest management activity such as gap creation and regeneration. May also refer to a particular, relatively small area of forest and/or other vegetation type(s).
Key Performance Indicators	The minimum set of performance measures identified in management plans to reflect the highest priorities of the department, joint management partner/s, the Commission and the community. They provide information on the progress in a specified reporting period towards the achievement of the related objective. They are usually presented with management targets and reporting requirements.	Performance measure	Qualitative or quantitative measures developed to assess progress toward attainment of an objective.
Landform	All the physical, recognisable, naturally formed features of land having a characteristic shape. Includes major forms such as a plain, mountain or plateau, and minor forms such as a hill, valley or alluvial fan.	Periodic assessments	Refers to the CALM Act responsibility of the Commission to conduct periodic assessments of the implementation of management plans by those responsible for implementing them. The term performance review as used in this document refers to the periodic assessments undertaken for the previous FMP.
Landscape scale	A term commonly used to refer to action that covers a large spatial scale, usually addressing a range of ecosystem processes, conservation objectives and land uses.	Pesticides	Includes herbicides, insecticides, fungicides and related products registered for use in pest control.
Legacy habitat elements	Refers to existing key habitat features, such as hollow-bearing trees and logs, which may take many decades to replace and which are retained after ecological thinning or remain after natural disturbance, which provide refugia and enrich the structural complexity of the new stand.	Public drinking water source areas (PDWSAs)	The areas from which water is captured to supply drinking water. It includes all underground water pollution control areas, catchment areas and water reserves constituted under the <i>Metropolitan Water Supply, Sewerage, and Drainage Act 1909</i> or the <i>Country Areas Water Supply Act 1947</i> .
Local area arrangements	Regulations that restrict Noongar customary activities exist where activities pose real and significant risks to public safety, flora and fauna values. Local area arrangements are informal agreements negotiated between DBCA and specific Noongar groups and families for undertaking restricted activities.	Public firewood areas	Areas designated for firewood collection in State forest located in DBCA's three forest regions, Swan (Perth Hills), South West and Warren.
Local scale	A discrete area of land to which one or more operations have been or are planned to be applied.	<i>Phytophthora cinnamomi</i>, or <i>P. cinnamomi</i>	A microscopic and soil-borne organism. The pathogen that causes most <i>Phytophthora</i> dieback disease.
Management activities	Actions delivered to achieve management objectives.	Policy	A document containing principles and rules that outline an organisation's position and which guides decisions and actions taken in the conduct of its activities.
Management effectiveness	Management effectiveness in DBCA is primarily the extent to which management is achieving management plan objectives, activities and targets.	Prescribed burning	Prescribed burning is the process of planning and applying fire to a predetermined area under specific environmental conditions to achieve a desired outcome. Prescribed burns follow a 'prescription' with a number of conditions that need to be met.
Management objectives	The primary aims of management during the planning period that reflect the statutory requirements of the CALM Act [and cultural responsibilities of the Noongar Traditional Owners].	Previous FMP	<i>The Forest Management Plan 2014-2023</i> .
Measures	Indicators of effectiveness in achieving the management targets and objectives for values. For example, the diversity and abundance of species, or the level of vegetation loss/clearing. Performance measures should ideally be quantitative, representative, simple and cost-effective.	Priority ecological communities	Priority Ecological Communities are possible Threatened Ecological Communities that are inadequately surveyed, or that are not adequately defined or are adequately known and are rare but not threatened. PECs are ranked Priority 1 to 5, depending on the level of urgency for assessment of status.
Mesic area	In ecology a mesic habitat is a type of habitat with a moderate or well-balanced supply of moisture.	Provenance	'Seed provenance' is where the seed geographically comes from. Seed provenance is an important factor influencing germination. Use of local seed provenances is often recommended in restoration as they are thought to be better adapted to local habitat conditions.
Metham sodium	A soil fumigant.	Recovery plan	A plan that describes the actions required to achieve the recovery of threatened species or ecological community from the current threat of extinction or destruction. May be an Interim Recovery Plan when insufficient information is available to prepare a full recovery plan.
Monitoring	The regular observation and recording of activities taking place in a project or program to check how project activities are progressing. For the purposes of the plan monitoring assesses management outcomes, the condition of the environment and resources being managed to help determine if desired outcomes are being achieved.	Regeneration	The natural process of ecosystem recovery following disturbance, for example regrowth of vegetation following fire.
Montreal Process	An agreed framework of criteria and indicators that provide member countries with a common definition of what characterises sustainable management of temperate and boreal forests (see Appendix 2).	Regional fuel management plans	Delineate Fire Management Areas based on fuel, biogeography, and land use; and set objectives, strategies, and success criteria for fire management in a five-year planning horizon. These plans underpin the development of seasonal prescribed fire programs; indicative multi-season prescribed fire programs and prescribed fire plans.
Net zero emissions	Refers to achieving an overall balance between greenhouse gas emissions produced and greenhouse gas emissions taken out of the atmosphere.	Regrowth forest	Native forest which is dominated by similar-aged stems that have not reached the mature growth stage, originating from previous harvest events, or other disturbances, such as bushfire.
Noongar Land Base Strategy	Sets out targets for identification and allocation of land to the Noongar Land Estate.	Rehabilitation	The process to attempt to improve the composition and function of an ecosystem to a predetermined state following disturbance, acknowledging that restoration to its original state may not be achievable.
Noongar Land Estate	Through the South West Native Title Settlement the Noongar Land Estate (NLE) will provide the Noongar people with a significant asset to be developed in line with Noongar cultural, social and economic aspirations for benefit of future generations. The NLE will be held by the Noongar Boodja Trust.	Removal	For the purposes of the plan removal of forest products is the moving of the forest products from the site in State forest or timber reserve.
Notching	The creation of V-shaped notches into the cambium layer around the circumference of a tree, and associated injection of herbicide to induce tree mortality.	Reservoir Protection Zones	A buffer measured from the high water mark of a drinking water reservoir, inclusive of the reservoir (usually 2km). This is referred to as a prohibited zone under the <i>Metropolitan Water Supply, Sewerage, and Drainage Act By-laws 1981</i> .
Old-growth forest	Ecologically mature forest where the effects of unnatural disturbance are now negligible. The definition focuses on forest in which the upper stratum or overstorey is in a late mature to senescent growth stage. The Regional Forest Agreement process developed criteria to operationalise this definition for mapping purposes.	Resource development	Exploration and development activities undertaking for mineral and petroleum resources, under the Mining Act, PGER Act and/or State Agreement Acts.
Open cut mining	A surface mining technique that extracts minerals from an open pit in the ground.	Restoration	The process to return an ecosystem in form and composition to its pre-disturbance or natural state following disturbance

Revegetation	The process of replanting or re-establishing a cover of vegetation to disturbed land. It can be a natural process produced by recolonisation and succession or a human-accelerated process to repair damaged land.
Resilience	The capacity of an ecosystem to withstand external pressures and, over time, return to its prior condition, including its ability to maintain its essential characteristics such as taxonomic composition, structural forms, ecosystem functions and processes (adapted from Thompson <i>et al.</i> 2009, who cite Holling 1973).
Restoration	The process to return an ecosystem in form and composition to its pre-disturbance or natural state following disturbance.
Riparian	Pertaining to the banks of streams, rivers or lakes.
Salinity	Secondary salinity is caused when groundwater levels rise, bringing naturally occurring salt to the surface and dissolving salt in previously unsaturated parts of the soil profiles. This harms salt intolerant vegetation (vegetation conditioned to grow in low salt conditions).
Salvage	For the purposes of the plan, 'salvage' from State forest and timber reserves involves the recovery of forest products from trees that have been felled (such as in thinning activities), damaged (such as from significant natural disturbances) or other activity (such as road construction).
Sawlog	A felled tree trunk that meets minimum specified standards of diameter, length and defect for cutting into timber.
Silviculture	The theory and practice (silvicultural practices) of managing the establishment, composition, health, quality and growth of forests and woodlands to achieve specified management objectives.
Softwood	Wood from gymnosperm trees such as conifers (this includes the various species of pine within the plan area, principally Radiata and Monterey pine).
South West Conservation Estate	Refers to all lands and waters within the South West Native Title Settlement Area and includes State forests, national parks, nature reserves and other areas set aside for conservation, currently managed by DBCA.
Specially protected	Under the BC Act specially protected species means a native species that is listed as a specially protected species under section 13(1) of the Act.
Stand	A group of trees or patch of forest that can be distinguished from other groups on the basis of size, age, species composition, structural condition or other attributes.
Stand structure	The horizontal and vertical distribution of components of a stand, often characterised by the height, diameter, crown layers and stems of trees, shrubs, herbaceous understorey and woody debris.
Strategic goals	The overarching plan directions that align with DBCA's legislative responsibilities, ESFM principles and the Montreal framework criteria.
Structure	When applied to a forest, is the horizontal and vertical distribution of the live and dead vegetation.
Target	The end points of management and should be SMART (specific, measurable, achievable, relevant and time-based). Ecological targets are usually able to be represented spatially and are set as either the 'natural state' or some acceptable departure from the 'natural state'. Targets often provide a benchmark to assess success or otherwise of management responses within the life of the plan.
Threatened ecological communities	Threatened ecological communities are naturally occurring groups of plants, animals and other organisms that occur in a particular type of habitat and are at risk of collapse due to threats such as land clearing, grazing, weed invasion, hydrological changes and inappropriate fire regimes. They are ranked in three categories: critically endangered, endangered or vulnerable.

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Hon Reece Whitby MLA
Minister for Environment; Climate Action; Racing and Gaming

Published on: 30 November 2023

Statement No. 1214

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(Environmental Protection Act 1986)

FOREST MANAGEMENT PLAN 2024–2033

Proposal: The Forest Management Plan 2024–2033 (FMP 2024–2033) is a statutory plan for the management of approximately 2,522,000 hectares of land and waters vested in the Conservation and Parks Commission in the South West of Western Australia, in accordance with the *Conservation and Land Management Act 1984* to fulfil the statutory purposes for which that land is reserved. The proposal is to undertake a range of management activities, the most significant being conservation reserve creation, ecological thinning and prescribed burning, to balance multiple use objectives, deliver conservation outcomes and enhance ecological and climate resilience.

Proponent: Conservation and Parks Commission

Proponent address: 17 Dick Perry Avenue
KENSINGTON WA 6151

Assessment number: 2361

Report of the Environmental Protection Authority: 1745

Introduction: Pursuant to section 45 of the *Environmental Protection Act 1986*, it has been agreed that the proposal entitled Forest Management Plan 2024–2033 described in the 'Proposal Content Document' attachment of the referral of 17 October 2022, may be implemented and that the implementation of the proposal is subject to the following implementation conditions and procedures:

Conditions and procedures

Part A: Required amendments and proposal extent

Part B: Environmental outcomes and objectives

Part C: Environmental monitoring

Part D: Other conditions

PART A: REQUIRED AMENDMENTS AND PROPOSAL EXTENT

A1 Amendments to the Proposal

A1-1 The proponent shall amend the proposal to incorporate the requirements of this Statement prior to it being transmitted to the Minister for Environment under the *Conservation and Land Management Act 1984*.

A1-2 The proponent shall report to the Minister for Environment on how condition A1-1 has been met.

A2 Limitations and Extent of Proposal

A2-1 The proponent shall amend the proposal such that when implemented, the following extent is not exceeded:

Proposal element	Location	Maximum extent
Operational elements		
Ecological thinning	State forest and timber reserves	No more than 8,000 ha per year

PART B – ENVIRONMENTAL OUTCOMES AND OBJECTIVES

B1 Flora and Vegetation, Terrestrial Fauna, Inland Waters and Terrestrial Environmental Quality

B1-1 The proponent shall amend the proposal such that it is to be implemented in a manner that:

- (1) seeks to maintain **biological diversity** and **ecological integrity** with respect to forest health in mature ecosystems;
- (2) seeks to improve **biological diversity** and **ecological integrity** with respect to forest health in degraded ecosystems and rehabilitated areas; and
- (3) maintains the quality of land, soils and water.

B1-2 The proponent shall amend the proposal such that it is to be implemented so as to achieve the following environmental objective:

- (1) land areas subject to the plan are managed consistent with the achievement of the environmental outcomes in B1-1 for the entire plan area as well as for the achievement of the objective of any specific land category prescribed for that area under legislation.

B2 Flora and Vegetation, Terrestrial Fauna, Inland Waters and Terrestrial Environmental Quality

B2-1 The proponent shall amend the proposal such that an evaluation report must be prepared for the endorsement of the Conservation and Parks Commission on whether **ecological thinning** is likely to meet the requirements in condition B1 prior to it being implemented in areas identified as:

- (1) **disturbance avoidance zones;**
- (2) formal conservation reserves; and
- (3) **proposed conservation reserves.**

B2-2 The proponent shall amend the proposal such that the silvicultural guidelines for ecological thinning and any future iterations of these guidelines shall be made publicly available as soon as practicable once finalised.

B3 Annual ecological thinning plans

B3-1 The proponent shall amend the proposal such that **annual ecological thinning plans** must be published annually and include:

- (1) identification of candidate areas;
- (2) criteria used to identify candidate areas;
- (3) an evaluation of how the planned **ecological thinning** is likely to be consistent with achievement of condition B1;
- (4) outcomes of consultation with the Department of Water and Environmental Regulation and Water Corporation (where **ecological thinning** occurs in drinking water catchment areas), Noongar regional corporations, mining companies, conservation groups, and forest-based industries and businesses; and
- (5) evidence of adaptive management and incorporation of learnings from the implementation of previous **annual ecological thinning plans** to demonstrate continuous improvement.

B4 Periodic Performance Assessment

B4-1 The proponent must arrange for an **independent review** of the performance of **ecological thinning** in achieving the outcomes referred to in condition B1.

B4-2 The outcome of the **independent review** required by condition B4-1 is to be included in the **periodic performance assessments** of the implementation of the proposal.

B4-3 The **periodic performance assessments** of the implementation of the proposal are to include:

- (1) an assessment against the achievement of the proposal's strategic goals;
- (2) an assessment of the effect of **ecological thinning** and **prescribed burning** activities in achieving the proposal's strategic goals;
- (3) the progress towards the creation of 400,000 ha of **reserve proposals**;
- (4) timelines to complete creation of 400,000 ha of **reserve proposals**;
- (5) if **reserve proposals** targets are unlikely to be met by the end of the term of the proposal, an explanation as to why targets are unlikely to be met;
- (6) if not yet formally reserved, a demonstration that identified target areas are being managed consistent with the intended or proposed change of purpose;
- (7) details on the progress towards achieving the **previously proposed additions** to the conservation estate;
- (8) a description of any changes to **ecological thinning** prescriptions and guidelines as evidence of adaptive management; and
- (9) a description of any changes to **prescribed burning** policies and practices as evidence of adaptive management.

PART C – ENVIRONMENTAL MONITORING

C1 Conditions Related to Monitoring

C1-1 The proponent shall amend the proposal such that the **forest health monitoring program** implementation plan shall be published.

PART D – OTHER CONDITIONS

D1 Public Availability of Data

D1-1 The proponent shall amend the proposal such that a biennial report that summarises activities and implementation of the forest health monitoring program shall be published, including through relevant publications.

D2 Scientific Research Program

D2-1 A scientific research program into **prescribed burning** is to be established, with the aim of investigating the measured impacts on forest ecosystems and biodiversity from fire management strategies and bushfires.

D2-2 The scientific research program required by condition D2-1 is to be carried out for the 10-year life of the proposal, without compromising the broader responsibility of **prescribed burning**.

D3 Stakeholder Consultation

D3-1 The proponent shall amend the proposal such that:

- (1) within five years of the date of this Statement, a draft of the proposed boundaries of the newly created 400,000 ha reserves will be publicly released to support stakeholder consultation, including interested community groups.

[signed on 30 November 2023]

Hon Reece Whitby MLA

MINISTER FOR ENVIRONMENT; CLIMATE ACTION

Table 1: Abbreviations and definitions

Acronym or abbreviation	Definition or term
Annual ecological thinning plan	Plans prepared ahead of implementation of the annual ecological thinning program that depict the candidate areas and the activities proposed to be undertaken in those areas.
Biological diversity	The variability among living organisms and the ecosystems of which those organisms are a part and includes: <ol style="list-style-type: none"> a) diversity within native species and between native species; b) diversity of ecosystems; c) diversity of other biodiversity components.
Disturbance avoidance zone	Areas within State forest and timber reserves where planned disturbance activities are to be avoided or minimised and depicted in Figure 2. The term combines the various types of informal reserves described in Appendix 1c Disturbance Avoidance Zones in State forest and timber reserves to the <i>Draft Proposed Forest Management Plan 2024-2033, May 2023</i> .
Ecological integrity	The composition, structure, function and processes of ecosystems, and the natural range of variation of these elements.
Ecological thinning	An active forest management tool that involves the selective removal of individual trees to improve or maintain ecological value and reduce current and future moisture stress of a given area.
Forest health monitoring program	A monitoring program designed and implemented to achieve the aims and objectives stated in section 6.2.2 of the <i>Draft Proposed Forest Management Plan 2024–2033, May 2023</i> .
ha	Hectare
Independent review/ Independently reviewed	A review undertaken by a person that can demonstrate their relevant qualifications, knowledge, expertise, and working experience in ecological sciences. The reviewer should act independently using their balanced professional judgement of proposal-specific data and information, consistent with national and international policies, guidelines, and best available information. The reviewer should be able to demonstrate their independence to avoid any actual, potential, or perceived conflicts of interest that may arise.
Periodic performance assessments	Refers to the <i>Conservation and Land Management Act 1984</i> responsibility of the Conservation and Parks Commission to conduct periodic assessments of the implementation of management plans by those responsible for implementing them.

Acronym or abbreviation	Definition or term
Prescribed burning	Prescribed burning is the process of planning and applying fire to a predetermined area under specific environmental conditions to achieve a desired outcome. Prescribed burns follow a 'prescription' with a number of conditions that need to be met.
Previously proposed additions	Approximately 320,000 ha of additions to the conservation estate proposed in forest management plans previous to the <i>Draft Proposed Forest Management Plan 2024–2033</i> , May 2023.
Proposed conservation reserves	Areas proposed for conservation in the Forest Management Plan 2014-2023 and from subsequent land acquisitions and area management plans consistent with Map 13 of the <i>Draft Proposed Forest Management Plan 2024–2033</i> , May 2023.
Reserve proposals	Proposed and indicative additions to the conservation estate consistent with Map 13 and Appendix 7 of the <i>Draft Proposed Forest Management Plan 2024–2033</i> , May 2023.

Figures (attached)

Figure 1 Proposal area (This map is a representation of the co-ordinates referenced in Schedule 1)

Figure 2 Disturbance Avoidance Zones



Figure 1 - Proposal area

Schedule 1

All co-ordinates are in metres, listed in Map Grid of Australia Zone 50 (MGA Zone 50), datum of Geocentric Datum of Australia 2020 (GDA2020).

Spatial data depicting the figures are held by the Department of Water and Environmental Regulation. Record no. DWER-801164602-9255.

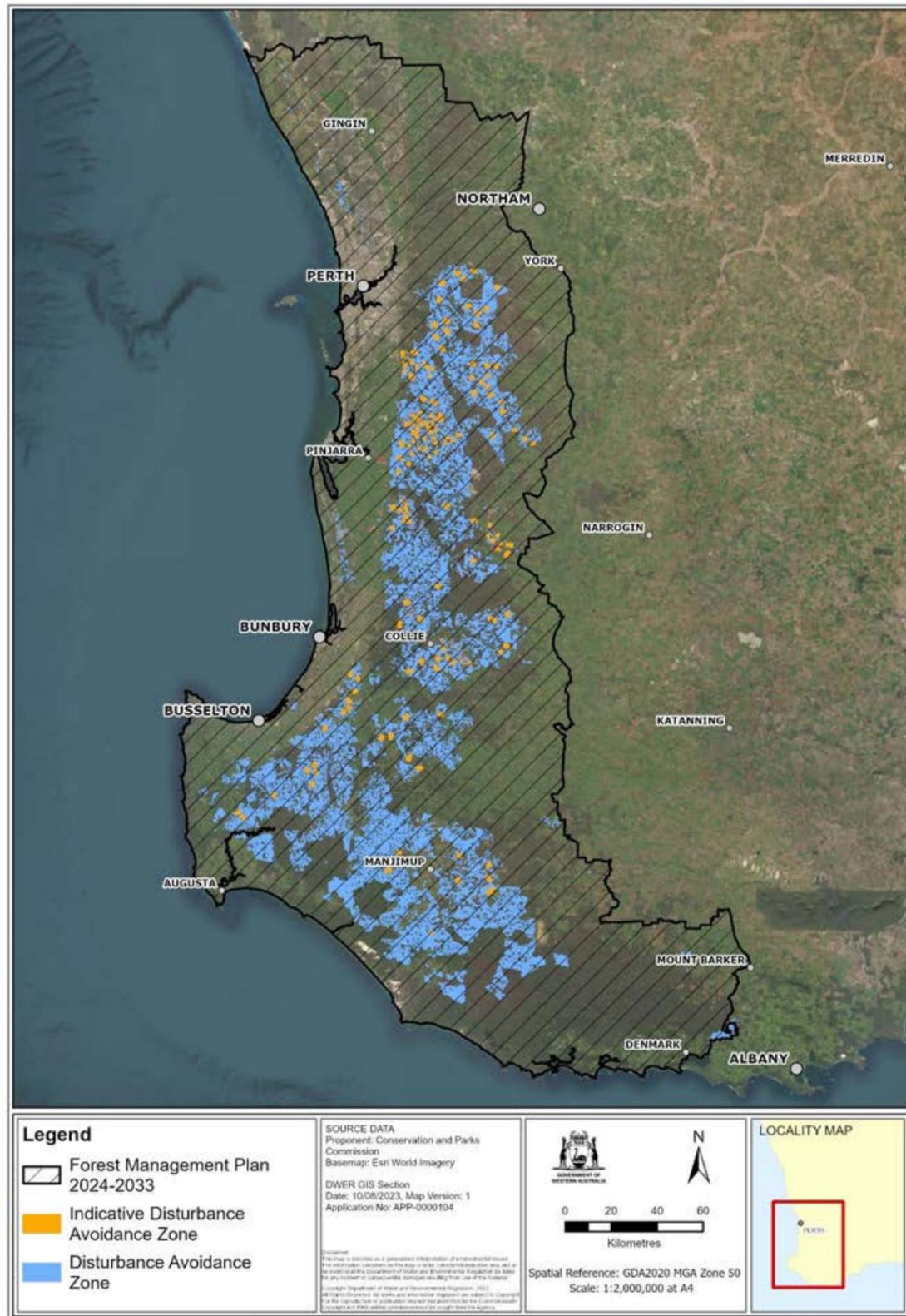


Figure 2 - Disturbance avoidance zones

