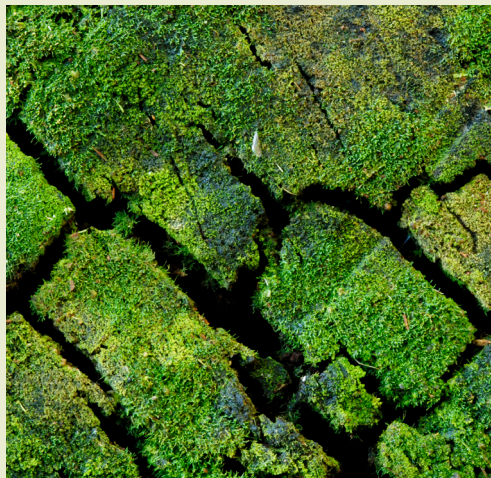




Government of **Western Australia**
Conservation and Parks Commission

Draft mid-term review of performance of the **Forest Management Plan 2014–2023**



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Government of **Western Australia**
Conservation and Parks Commission

Draft mid-term review of performance of the
Forest Management Plan 2014–2023

Draft for public comment
September 2018

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Executive Summary

This draft document is the Conservation and Parks Commission's mid-term performance review of the *Forest Management Plan 2014-2023* (FMP), as required by management activities 130-132 of the FMP, and is available for public submissions over a six week period.

This performance review of the FMP provides the State Government, the Western Australian public, and other interested parties with an assessment of the implementation of management activities contained in the FMP which were developed to achieve ecologically sustainable forest management (ESFM) outcomes for forests of the south-west. The principle of ESFM is that the economic and social values derived from the use of the natural areas covered by the plan, should be provided through a management system that is based on consideration of its impacts on biodiversity and is precautionary in nature.

This draft mid-term performance review presents an analysis of the best available information to provide an indication on what is going well and where management effort needs to be focussed in the future by the management agencies, the Department of Biodiversity, Conservation and Attractions (Department) and the Forest Products Commission (FPC) as well as the plan's vesting authority, the Conservation and Parks Commission (the Commission).

The key performance indicator (KPI) information used in this report has been provided by the Department and the FPC. The level of achievement attributed to each KPI was determined by the Department or the FPC, where relevant, and provided to the Commission to enable the review.

This review analysed results for the 24 KPIs defined in the FMP. This involved determining their status in relation to established targets, identifying underlying causes that could be attributed towards a rating of the achievement of targets, establishing trends over time, and providing recommendations to improve performance through enhanced and prioritised management activities for the remaining period of the FMP. Trends in performance are a comparison of performance in this report against that in the FMP 2004-2013 end-of-term audit of performance report.

A report card summarising mid-term performance against targets for the KPIs of the FMP is shown below (Table 1).

Table 1. Summary of performance against key performance indicator targets.

Legend

Reporting metric	Rating and symbol
Achievement / progress	Performance target not achieved / no progress
	Performance target not achieved but performance measure or success criteria are met in some cases
	Performance target not achieved but performance measure or success criteria are often met
	Performance target achieved
Direction of progress	Improved
	Steady

(compared to previous period)	Decreased	↓
Confidence in rating (C)	Low	L
	Medium	M
	High	H

Report card

KPI	Performance target	Achievement	C
1.1	No decline in the condition of identified healthy ecosystems listed across the whole of forest	↓	H
1.2	An increase in formal protection of regionally significant vegetation as identified in the applicable regional nature conservation plans	—	H
2	The target condition of TECs and PECs identified as priorities for management in the relevant regional nature conservation plans	—	M
3	The target condition of Ramsar and nationally listed wetlands as identified in the relevant regional nature conservation plans	↓	H
4	(Threatened flora) As defined in the relevant regional nature conservation plans	—	L
5	(Threatened fauna) As defined in the relevant regional nature conservation plans	↓	M
6a	Conformance to the theoretical distribution of time since fire for whole of forest	—	H
6b	Conformance to the theoretical distribution of time since fire for major LMUs	—	H
7.1	90 per cent of prescribed burns that meet their stated objective	—	H
7.2	Completion of the relevant regional fire management plans by mid-term	↗	H
8.1	(Distribution or density of priority weeds) as defined in the relevant regional nature conservation plans	↗	M
8.2	(Distribution or density of priority pests) as defined in the relevant regional nature conservation plans	—	L
8.3	(Distribution or density of priority diseases) as defined in the relevant regional nature conservation plans	↓	M
8.4a	No planned operations undertaken without an approved Hygiene Management Plan – timber harvesting	↓	H
8.4b	No planned operations undertaken without an approved Hygiene Management Plan – other disturbance activities	↗	M
8.4c	Less than three per cent of uninfested protectable area infested as a result of management activities – timber harvesting	↓	H
8.4d	Less than three per cent of uninfested protectable area infested as a result of management activities – other disturbance activities	—	L
9	Soil damage not to exceed prescribed maximum levels for 95 per cent of harvested cells surveyed (full text in FMP)	—	H
10.1	No gauging stations with annual flow weighted mean salinity that is not fresh as a result of management activities	—	H
10.2	No sites with a decline in streamflow as a result of management activities	—	H
10.3	No decline or rise in groundwater level that could lead to stream salinity not remaining fresh as a result of management activities.	—	H
11	Effectiveness of silviculture for water production	not applicable	H
12	Trend and knowledge report compiled at mid-term and used to inform reporting on achievement of KPI targets	—	H
13	Adaptive responses to be reported at mid-term	—	H
14	Twenty plots established and reported by mid-term	—	H

KPI	Performance target	Achievement	C
15	No permanent loss of net area of forested land due to unauthorised activities	—	H
16.1	Cumulative removals of first and second grade jarrah and karri sawlogs shall not exceed allowable cut	—	H
16.2	No more than the allowable cut of other bole volume of jarrah and karri and total bole volume of marri logs over the 10-year plan period	not yet due	
16.3	No more than the allowable cut of wandoo, blackbutt and sheoak sawlogs to be removed over the 10-year plan period	not yet due	
17.1a	Annual area of each silvicultural outcome for each forest type harvested and/or silviculturally treated (in karri)	—	H
17.1b	Annual area of each silvicultural outcome for each forest type harvested and/or silviculturally treated (in jarrah)	—	H
17.2	Silvicultural practices assessed by monitoring surveys against the requirements as prescribed (in jarrah)	—	H
18.1a	For karri and planted jarrah achieve more than 75 per cent of areas treated to be completed within 18 months	—	H
18.1b	For karri and planted jarrah achieve 100 per cent of areas treated to be completed within 30 months	—	H
18.1c	For jarrah which has not been planted achieve 90 per cent of areas treated to be completed within 30 months except in accepted circumstances	—	H
18.2	No more than five per cent of the area regenerated requiring remedial action – jarrah operations	—	H
18.3	No more than five per cent of the area replanted requiring remedial action – clearfelled plantations	—	H
19	Target as defined in the State agreements and contracts ¹	—	H
20.1	Establishment of at least six joint management arrangements under the CALM Act by 2023	not yet due	
20.2	Local are arrangements and protocols for Aboriginal customary activities established and implemented within each district by 2023	not yet due	
20.3	Appropriate and representative Noongar groups are consulted and invited to provide input into all management plans	—	H
21.1a	All high value sawlog resource processed or value added locally ¹	—	H
21.1b	An increase in low value resource taken on by local markets ¹	—	H
21.2	Increased local processing capacity ¹	—	M
21.3	Employment and social benefits maintained or increased ¹	—	L
22.1	Level of visitation to be maintained or increased	↗	H
22.2	No target, trends to be reported (recreation and tourism facilities)	↗	
22.3	Visitor satisfaction to meet or exceed Departmental benchmark	—	H
23	Access via strategic road network to be maintained	↘	H
24.1	Guidance documents to be prepared and/or reviewed as required during the period of the plan	—	H
24.2a	Research projects address identified high priority knowledge gaps	—	H
24.2b	Peer reviewed articles are produced by research projects	—	H

¹ As assessed by the FPC

KPI	Performance target	Achievement	C
24.2c	Knowledge gained is communicated to policy makers and operational managers	—	H
24.3a	Public attendance for key education, awareness and extension programs to be maintained	—	H
24.3b	Volunteer contribution (number of volunteers and volunteers hours) to be maintained	—	H

A number of key themes are evident in implementation of the FMP to date, based on the reports on KPIs and status of management activities. These themes are focussed on climate change and its impact, the forest products industry, monitoring and reporting of KPIs and resources for implementation of the FMP.

Climate change and its impact

When the FMP was developed, the Commission was particularly concerned with the vulnerability of forests to climate change. Climate change has impacted the FMP area to varying degrees through reductions in forest density and whole of forest condition (KPI 1), impacts on wetlands (KPI 3), increases in the incidence of landscape scale bushfires, increased complexity and constraints in prescribed fire (KPI 6), decreases in groundwater level and streamflow (KPI 10) and impacts on plantations from bushfire (KPI 15). The climate of the FMP area is projected to continue to change with further reductions in rainfall and higher temperatures. The observed climate is broadly consistent with that which was factored into the calculation of sustained yields of wood products and the FMP settings.

The FMP encourages adaption to climate change and a range of management responses are noted in the relevant sections of each KPI below. Management responses to climate change and its impact include continuing to review and revise management practices to enhance ecosystem resilience and align with altered productive capacity under a drying climate; continuing to undertake management actions to mitigate pressures on wetland condition; translocating threatened species to areas likely to be more suitable for survival under future climate scenarios; undertaking assisted gene migration for key species; continuing to undertake prescribed burning programs to reduce the risk of large bushfires; responding to bushfires to limit the impact on plantations; applying thinning to revised density targets in commercial timber harvesting; and investigating opportunities to apply silvicultural treatments that increase groundwater recharge and streamflow, and improve the resilience of affected ecosystems. However, it should be noted that 62 per cent of the area covered by the FMP is in conservation reserves or protected areas within which active management by thinning is not supported under the plan. Implementing silvicultural treatments for improved ecosystem health can be achieved in areas available for timber production through the encouragement of markets for other bole volume.

Forest products industry

The FMP provides for the utilisation of available wood products, the maintenance of forest area, and for social and economic benefits from forests to be realised. The south-west native forest industry operated below the production limits set in the FMP (KPI 16). However, challenges in economically accessing low sawlog yielding areas

in jarrah forest meant the industry did not fully utilise the available sawlogs and a large amount of jarrah and marri other bole volume. This under-utilisation has also resulted in preferred silvicultural outcomes not being achieved for a large part of the jarrah forest that was harvested (KPI 17), which will impact on future growth and, all other factors being equal, sustained yields. There will also be an increasing reliance by the wood products industry on lower sawlog yielding jarrah forest which is less economically viable. The FPC has indicated that the highly mechanised harvesting and extraction systems used by industry to improve worker safety made it difficult to achieve targets to limit soil damage (KPI 9) though outcomes have improved substantially since the introduction of changes to soil management requirements in the previous FMP.

Softwood supply targets were met (KPI 19) and there was significant investment in softwood plantations during the period, with the development of the *Softwood Industry Strategy for Western Australia* (FPC 2016) and the commitment of \$21 million to plant additional areas over five years. Despite this, the total area of plantations continued to reduce, largely through clearing for other land uses because of Government decisions including the reduction in plantation area arising from ceasing replanting on the Gngangara mound (KPI 15) and extensive bushfires. These area reductions are forecast to have an impact on future supply of wood products from plantations.

While there were investments in new processing technologies and consolidation of operations to improve operational efficiencies of the wood products industry, and employment and social benefits that flow from this (KPI 21), the limited markets for other bole volume from native forests (KPI 16) is a constraint on the delivery of silvicultural treatments for ecosystem health, sustainable industry development and the longer-term socio-economic benefits that flow from this.

Management responses relevant to the forest products industry include:

- the Department continuing to work with the FPC to ensure all operations are appropriately planned and harvest contractors are trained in the requirements for minimising soil disturbance;
- developing guidance for high utilisation operations to manage soil disturbance;
- the FPC continuing to seek to secure investment and access to markets for other bole volume, new technologies and processes to reduce production costs, and undertake trials of suitability for various engineered wood products;
- the Department taking into account the high proportion of selective outcome in jarrah forest when projecting future sustained yields;
- the FPC continuing to work proactively with industry and the community to seek to achieve a vibrant industry that makes a positive contribution to regional communities;
- seeking to minimise the reduction in forest area arising from the location of infrastructure on, alienation of lands, or the loss of plantation to other land uses, and seeking offsets when this does occur; and

- the FPC working with the Department and other agencies to secure additional plantation areas consistent with the *Softwood Industry Strategy for Western Australia* (FPC 2016).

Monitoring and reporting of key performance indicators

The evaluation of the extent to which the management of land has been undertaken in accordance with the plan relies on clear targets for KPIs, adequate and standardised methods for measuring performance that are applied consistently though time and across the Department's districts and regions, and systems and processes for storing, managing and reporting collected data and information. More complex and meaningful KPIs were developed for biodiversity for the current FMP, together with protocols for monitoring and reporting on them. The approach adopted relies on the prioritised management actions developed through the Department's draft regional nature conservation plans to guide monitoring.

Achievement of some of the KPI performance targets is beyond the ability of the Department and the FPC to influence. This applies particularly to those KPIs associated with conserving biodiversity. KPI 1 is an example of this, where the target is for no decline in the condition of identified ecosystems. However, it was expected that climate change would have an effect on ecosystem condition and this has been identified as the key reason for observed changes in condition. In many circumstances, these changes would be unable to be mitigated by any feasible management response.

The Department is developing improved prioritisation, reporting and data collection and storage systems toward a more systematic approach to utilising available resources and targeting them to the highest priority monitoring requirements. Systems and processes for storing, managing and reporting collected data and information are being developed and need to be used consistently to facilitate future data analysis and reporting.

Resources for implementation of the FMP

The FMP requires sufficient resources to enable its implementation. The tight fiscal environment in 2014 and subsequent years resulted in the Department's budget for coordinating the implementation of the plan, regulating the yield, delivering services and monitoring implementation declining by up to 50 per cent since 2014, while the appropriation and funding from FPC have declined in real terms over this period. This has resulted in resources being focussed on delivering key Government commitments and the highest priority activities.

The Department will continue to streamline management systems and focus available resources on the highest priority outcomes, including monitoring, to improve performance against FMP outcomes.

Commission commentary and recommendations

The mid-term review of performance indicators for the FMP considered the status of 49 measures to indicate the achievement or otherwise of performance targets for 24 KPI. About 80 per cent of performance targets were achieved or largely met, with 16

per cent of performance measures or success criteria only met in some cases, and four per cent of performance targets not achieved or not progressed.

The Commission acknowledges the management agencies for achieving this result given the challenging economic and climatic conditions over the last five years.

The Commission has made 19 recommendations.

1. *That the Department further investigate the cause of decline in vegetation density and provide a report to the Commission which attributes the additional factors that may have contributed to the outcomes of lower vegetation density in the affected forest ecosystems by January 2020.*
2. *That the Department continues to manage the proposed formal reserves consistent with their intended reservation purpose while pursuing opportunities to progress land category changes as proposed in the FMP.*
3. *That the measurement protocols for the KPI for threatened ecological communities be reviewed to clarify the methodology to be applied for the end of term performance assessment report to provide clear links to manageable significant pressures on ecological communities by January 2020.*
4. *That the measurement protocols for the KPI for Ramsar and nationally listed wetlands be reviewed to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between condition targets and the pressures on prioritised Ramsar and nationally listed wetlands by January 2020.*
5. *That the measurement protocols for the KPI for threatened flora be reviewed to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between condition targets and the pressures on relevant threatened flora by January 2020.*
6. *That the condition of key fauna species in the FMP area which have recovery plans in place be reviewed by the Department to determine if (i) the actions in the recovery plans have been implemented, and (ii) if this implementation has been effective.*
7. *That the measurement protocols for the KPI for threatened fauna be reviewed to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between condition targets and the pressures on relevant threatened fauna by January 2020.*
8. *That the performance target used by the Department for the KPI for distribution of fire age be reviewed in consultation with the Commission prior to the next FMP.*
9. *That the Department review KPI 7 following the performance review as detailed in the FMP in consultation with the Commission by January 2020.*
10. *That the measurement protocols for the KPI for weeds and pests be reviewed to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between performance*

targets and the pressures from relevant priority weeds and pests by January 2020.

- 11. That an investigation be undertaken to improve the effectiveness of road closures to reduce the impact of unauthorised road access on compromising the disease status of protectable areas.*
- 12. That the Department provides an annual consolidated compliance monitoring report on the number of operations with a Hygiene Management Plan and the implementation of those plans.*
- 13. That the Department continue to investigate opportunities for improving stream conditions through cost-effective management activities.*
- 14. That there is a continued focus of research towards understanding the implications of a drying climate on ecological function, biodiversity and forest health including consideration of treatments to improve the forests resilience in a future dryer climate.*
- 15. That the Department engages and collaborates with research providers to prioritise and integrate research and monitoring programs to inform and improve climate adaptation and mitigation, with the aim of meeting information needs to support the development of the next FMP.*
- 16. That the Department prioritise reporting on carbon stores over the coming years so that this information will be available for the next draft FMP.*
- 17. That the FPC prioritises the implementation of FMP management activities supporting the utilisation of allowable other bole volumes in jarrah forest to meet the forest health and productive capacity objectives of the FMP.*
- 18. That additional funding be sought and allocated towards maintaining the strategic road and bridge network to ensure safety for road users and access for bushfire suppression.*
- 19. That the Department and the FPC present a progress report to the Commission for KPIs where the performance review target was not achieved or only achieved some of the time, as well as addressing the recommendations of this report, annually by 30 September effective from 2019.*

The assessment of the achievement of performance targets for KPIs related to biological diversity and ecosystem health and vitality required information to be available from the Department through relevant regional nature conservation plans or regional fire management plans. This information was not readily available at the time of the review requiring consideration of relevant and appropriate surrogate measures. Although these surrogate measures did in many instances provide an indication of the status of the performance indicator, the lack of data made it difficult to draw conclusions with confidence.

With that in mind, the Commission is seeking to ensure continuous improvement in management to achieve the objectives of the FMP and to that end the recommendations provided in relation to specific KPI ratings should ensure the

effective implementation of the current FMP while continuing to build a rigorous knowledge base for the development of the next FMP in 2023.

1 Introduction

This performance review has been prepared as a requirement of the FMP, as the key policy framework for protecting and managing the lands vested in the Commission within the State's south-west forests. The FMP identifies goals, performance targets and proposed management activities to achieve these goals. The FMP is applicable to all lands vested in the Commission within the plan area, and there is a focus on State forest and timber reserves because it is primarily on these land categories that disturbance activities are permitted. These lands fall within the Department's Swan, South West and Warren administrative regions (Figure 1). The FMP is a 10-year plan that was developed in consultation with the community.

The Commission, Department and FPC are responsible for seeking to achieve the objectives of the FMP.

This performance review has been prepared using information provided by the Department and FPC and aims to report on progress in implementing the FMP and to contribute to continuous improvement in its implementation. The performance review does this through reporting on the 24 KPIs established in the FMP and providing a report card on progress with implementing the 134 management activities in the FMP (see Appendix 1). Trends in performance are a comparison of performance in this report against that in the *Forest Management Plan 2004-2013 End-of-term audit of performance report* (Conservation Commission of Western Australia 2012).

1.1 Approach

The KPI information used in this performance review has been provided by the Department and the FPC. The level of achievement attributed to each KPI was determined by the Department and provided to the Commission to enable the review.

The performance review is presented using a KPI traffic light reporting approach based on national State of the Environment best practice reporting. Each KPI was attributed a colour rating in terms of its progress towards achieving the set target, an indicator of the direction of progress when compared to the previous review period, and a confidence rating based on information available to make the assessment.

The report presents a summary of data and information used to determine the status towards achievement of a performance target, contributing factors and trends.

As part of undertaking the performance review, the Commission conducted a two-day field inspection to vested lands in the south-west, which comprised four Commissioners and two officers. The purpose was to observe forest management operations and gain a first-hand account of the implementation of protocols and procedures from operational staff including inspecting key sites related to values assessed through the KPIs. Commission members were able to directly question operational and management staff on information made available through preliminary draft reports previously presented to the Commission.



Figure 1: Area covered by the FMP.

2 Key Performance Indicator Reports

This section provides a summary of management activities undertaken by the Department or the FPC related to the implementation of the FMP. The following points provide key achievements during the reporting period.

- Continued implementation of core elements of the management system as reflected in management activities required by the FMP (see report card on management activities at Appendix 1).
- Increased funding through the State Government's Royalties for Regions initiative enabled increased prescribed burning and improvement of achievements against fire management targets.
- The Department's Western Shield program continued to be implemented in selected areas and provided protection for threatened fauna from predation by foxes. Trial baiting in selected areas to protect threatened fauna from feral cats commenced in the reporting period.
- Increased knowledge of trends in climate and the implications for key aspects of forest management, which has been used to inform interpretation of performance for a range of key performance indicators. Additionally, there were a wide range of actions taken since commencement of the FMP to adapt forest management practices, trial mitigation measures and monitor impacts, in response to the drying and warming trend experienced in the plan area.
- The FPC maintained certification to the Australian Forestry Standard (AS4708:2013) and the Environmental Management System (ISO14001:2004). Removal of wood products were within limits.
- Areas of previously unmapped old-growth forest continued to be identified for protection ahead of disturbance activities.
- Regeneration of karri forest was undertaken in a timely manner and targets for a limited amount of remedial regeneration treatment were met. Regeneration of 227 hectares of fire-affected karri forest near Northcliffe was undertaken by the FPC. Regeneration in jarrah forest coupes was effective.
- The Department prepared a comprehensive corporate policy and guideline relating to joint management with Aboriginal people. This policy and guideline will assist with implementation of the joint management arrangements under the South West Native Title (SWNT) Settlement when the Indigenous Land Use Agreements (ILUAs) are registered and all outstanding legal matters are resolved. Local area management arrangements are developing and consultation with appropriate and representative Noongar groups is routinely undertaken. The FPC has entered into Noongar Standard Heritage Agreements.
- There has been some significant local industry investment in improving efficiency and new technologies, including the 2016 consolidation of Auswest's sawmills at the Greenbushes site.

- The *Softwood Industry Strategy for Western Australia* (FPC 2016) was developed to provide a strategic approach to softwood plantation development and increase the area of new plantings.
- Considerable investment in new and upgraded recreation sites and campgrounds led to an increase in visitation, and visitor satisfaction was above target.
- Volunteer numbers and time volunteered increased.
- Guidance documents required by the plan were developed in a timely manner.

2.1 KPI 1 Whole of forest condition

KPI	Performance target	Achievement	C
1.1	No decline in the condition of identified healthy ecosystems listed across the whole of forest.	↓	H
1.2	An increase in the formal protection of regionally significant vegetation as identified within the applicable regional nature conservation plans.	—	H

2.1.1 Condition of Ecosystems

Status

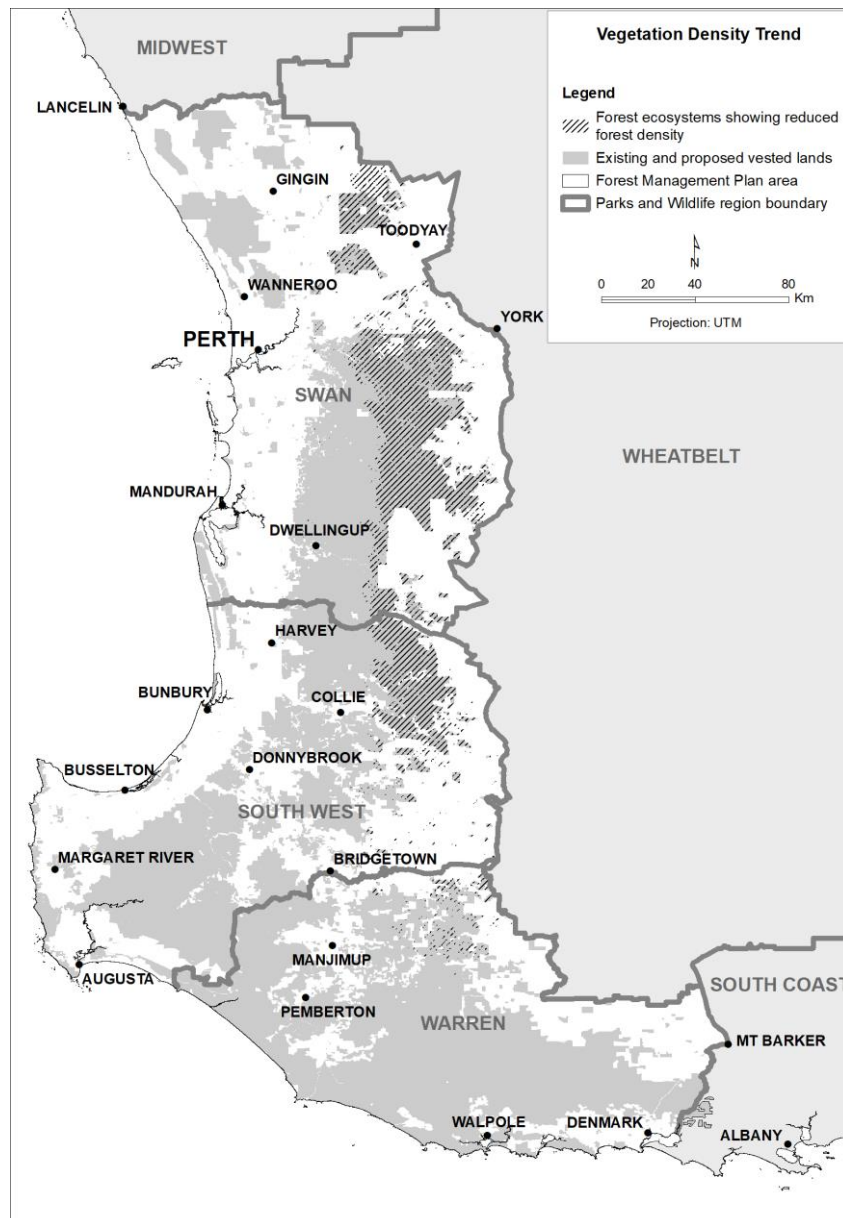


Figure 2: FMP area showing where the reductions in vegetation density were observed.

Trend analysis using satellite (LANDSAT) data compared vegetation density trends for the 10-year period to mid-term (2008 to 2017) with the 10-year period of the previous FMP (2004 to 2013). Once the data were corrected for impacts from known causes, such as fire, timber harvesting or mining, the analysis showed that vegetation density has reduced in around 12 per cent of the forested area. This change is most pronounced in the north and east of the FMP area as shown in Figure 2, in the Jarrah North East, Jarrah North West and Western Wandoo Forest and Woodland ecosystems² (Figure 3). The least affected ecosystems, including Southern Jarrah, Karri and Tingle, were in areas of higher or more stable rainfall. Approximately half the ‘most affected’ areas were in conservation reserves.

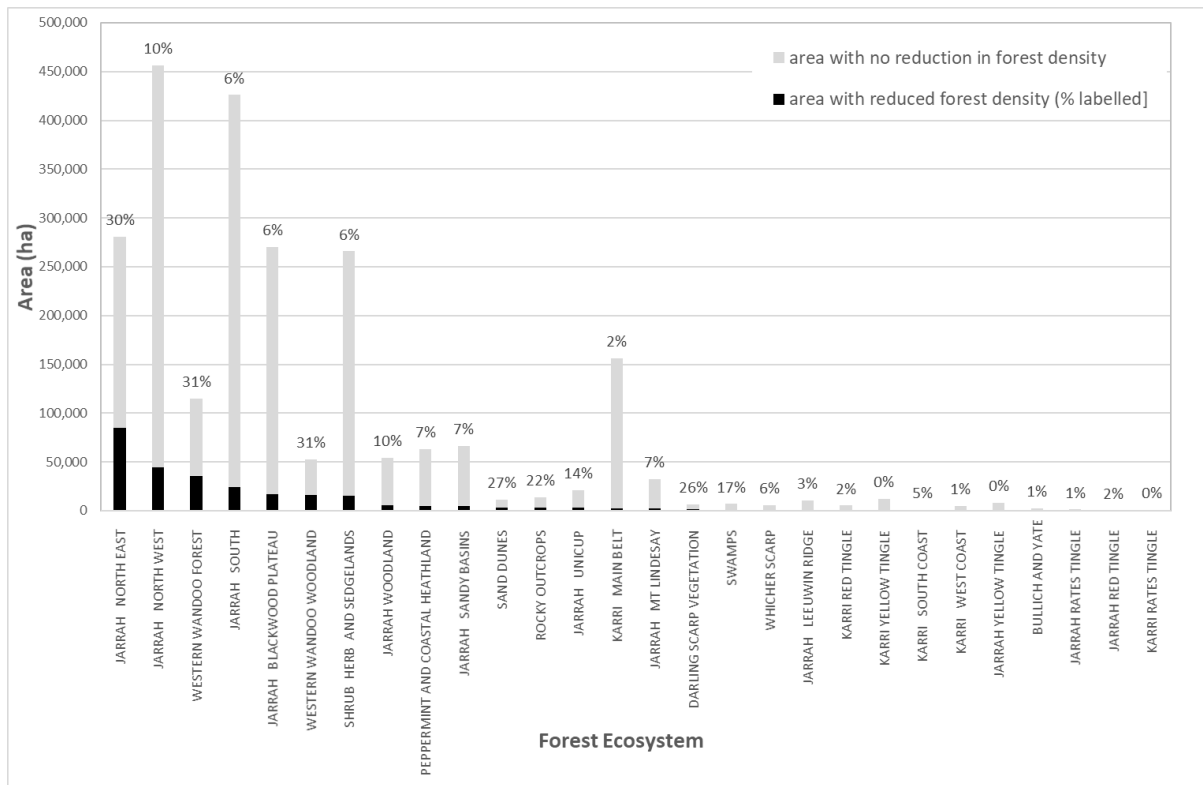


Figure 3: Extent to which various forest ecosystems show reduced forest density.

What contributed to this rating?

- The changes observed in vegetation density are consistent with lower rainfall and higher temperatures (see KPI 12) and the longer-term reduction in rainfall that has been occurring since the 1970s resulting in reduced streamflow, lower groundwater levels and altered forest hydrology (see KPI 10).
- It is considered that observed changes reflect that the forest adapting to drier and warmer conditions.

² Forest Ecosystems map available at: http://www.agriculture.gov.au/SiteCollectionImages/rfa/regions/wa/regional-assesment/volume-2-maps/rfa_eco.qif

Commission recommendation

The Commission notes that the decline in vegetation density observed is broadly consistent with climate change prediction models applied in the development of the FMP. It would be of benefit to gain a better understanding of the impact of crown density changes on all components of the affected ecosystems.

Recommendation 1: That the Department further investigate the cause of decline in vegetation density and provide a report to the Commission which attributes the additional factors that may have contributed to the outcomes of lower vegetation density in the affected forest ecosystems by January 2020.

Proposed management response

As climate change is considered the primary cause of the reductions in forest vegetation density, particularly in the eastern jarrah and wandoo forest and woodland ecosystems, it is considered unlikely that either management actions or authorised activities have contributed to the change in vegetation density.

The Department will:

- continue to review and revise management practices to enhance ecosystem resilience and align with altered productive capacity under a drying climate (see KPI 13); and
- work with the FPC, Water Corporation and other water providers to investigate opportunities to apply silvicultural and other treatments in State forest that improve the resilience of affected ecosystems.

2.1.2 Reserve System

Status

- Of the 306 individual proposals for land category changes proposed in the FMP (2004-2013) 144 were gazetted early during the period of that plan, which represents 88 per cent of the area proposed to be reserved when fully implemented. However, since commencement of the current FMP, no further FMP proposals for land category change have been gazetted.
- Most forest ecosystems are well represented in reserves and are close to target reservation levels. Those ecosystems that are least well represented, due to impediments to progressing the proposed reservations, include Jarrah north east, Western wandoo forest and Western wandoo woodland. However, it is important to note that the management of these areas is consistent with their intended reservation purpose.

What contributed to this rating?

The reasons for not implementing new reserves remain the same as those reported in the end-of-term audit of performance report of the previous FMP and are mainly due to resolution of Native Title, identified mineral resources and mineral prospectivity, the rights of State Agreement Act mining lessees, and Government priorities for reservation of conservation lands and waters elsewhere in the State.

Commission recommendation

The Commission acknowledges that the remaining proposed reservations are currently managed consistent with their intended reservation purpose irrespective of the lack of formal gazettal of their land category.

Recommendation 2: That the Department continues to manage the proposed formal reserves consistent with their intended reservation purpose while pursuing opportunities to progress land category changes as proposed in the FMP.

Proposed management response

- The Department will continue to manage the areas proposed in the FMP for inclusion in a national park, nature reserve or conservation park consistent with their proposed land category and purpose as if they were formally created.
- The Department and the Commission will continue to pursue opportunities to progress land category changes proposed in the plan.
- The Department will focus available resources for progressing land category changes to areas of Government priority. This includes the proposed expansion of the Wellington National Park, which is in addition to reserve changes proposed in the FMP.

2.2 KPI 2 Threatened ecological communities

KPI	Performance target	Achievement	C
2	The target condition of TECs and PECs identified as priorities for management in the relevant regional nature conservation plans.	—	M

The draft regional nature conservation plans provide a framework for prioritising management actions to conserve and manage biodiversity assets.

Status

Prioritised management actions aim to slow the decline, maintain or improve the condition of identified threatened ecological communities (TECs) and priority ecological communities (PECs). Trends in the condition of 35 ecological communities (22 TECs and 13 PECs) were assessed based on the change in vegetation cover index as observed from satellite imagery (LANDSAT) over the 10-year period of 2008-2017. An overall trend was determined after assessing each 30m x 30m pixel to determine the most common result across the entire area of an ecological community.

The condition of the ecological communities assessed remained primarily stable, with 19 ecological communities (54 per cent) having a stable perennial vegetation cover index over the 10-year period. The remaining 16 ecological communities showed a decreasing trend in vegetation cover (Table 2).

Based on advice from regional staff, some of the factors that may have contributed to the change in vegetation cover index, such as fire, drought or development are shown in Table 2 below. As such, Table 2 indicates where a temporary impact may have contributed to a decreasing trend in vegetation cover index and the type of impact that occurred.

Table 2: Trend in condition and occurrence of TECs and PECs identified as priorities for management.

Ecological Community (conservation category) * Indicates the community is part of an EPBC Act listed TEC	Trend ³	Occurrence ⁴		
		S	SW	WA
Acacia shrublands on taller dunes (P3)	decrease ^F	✓		
<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain (EN)*	stable	✓		
<i>Banksia attenuata</i> woodlands over species rich dense shrublands (EN)*	decrease ^F	✓		
<i>Banksia</i> woodlands of the Gingin area restricted to soils dominated by yellow to orange sands (P2)	decrease ^R	✓		
<i>Callitris preissii</i> (or <i>Melaleuca lanceolata</i>) forests and woodlands, Swan Coastal Plain (VU)	decrease ^F	✓		
Central northern Darling Scarp granite shrubland community (P4)	stable	✓		
Claypans with mid dense shrublands of <i>Melaleuca lateritia</i> over herbs (P1)*	stable	✓	✓	
Coastal shrublands on shallow sands, southern Swan Coastal Plain (P3)	decrease ^{U,W}	✓		

³ D: drought; F: fire; P: *Phytophthora* dieback; R: declining rainfall; U: development; W: weed invasion

⁴ S: Swan Region; SW: South West Region; WA: Warren Region

Ecological Community (conservation category) * Indicates the community is part of an EPBC Act listed TEC	Trend ³	Occurrence ⁴		
		S	SW	WA
Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain) (CR)	stable	✓		
Dense shrublands on clay flats (VU)*	stable	✓	✓	
<i>Eucalyptus calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern Swan Coastal Plain (VU)	stable	✓		
<i>Eucalyptus calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain (CR)*	stable	✓		
<i>Eucalyptus calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, Swan Coastal Plain (CR)*	stable	✓		
Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain (VU)	decrease ^{D, W}	✓		
Granite communities of the northern Jarrah Forest (P3)	decrease ^{D, F}	✓		
Herb rich saline shrublands in clay pans (VU)*	stable	✓	✓	
Herb rich shrublands in clay pans (VU)*	stable	✓	✓	
Litter-dependant invertebrate community of the northern jarrah forest (P2)	stable	✓		
Low lying <i>Banksia attenuata</i> woodlands or shrublands (P3)*	decrease ^{F, P}	✓		
<i>Melaleuca huegelii</i> - <i>Melaleuca systema</i> shrublands on limestone ridges (Gibson <i>et al.</i> 1994 type 26a) (EN)	stable	✓		
Mount Saddleback heath communities (P1)	stable	✓		
Mt Lindesay – Little Lindesay vegetation complex (EN)	stable			✓
Northern Spearwood shrublands and woodlands (P3)*	decrease ^{D, F}	✓		
Perth to Gingin Ironstone Association (CR)	decrease ^F	✓		
Scott River Ironstone Association (EN)	decrease ^F	✓	✓	✓
Sedgeland in Holocene dune swales of the southern Swan Coastal Plain (CR)*	stable	✓		
Shrublands and woodlands of the eastern side of the Swan Coastal Plain (CR)	decrease ^{F, P, R}	✓		
Shrublands and woodlands on Muchea Limestone (EN)	stable	✓		
Shrublands on calcareous silts of the Swan Coastal Plain (VU)	decrease ^F	✓		
Shrublands on dry clay flats (EN)*	stable	✓	✓	
Shrublands on southern Swan Coastal Plain Ironstones (Busselton area) (CR)	stable		✓	
Southern wet shrublands, Swan Coastal Plain (EN)	decrease ^{U, W}	✓		
South-west coastal (Quarram) grasslands (P1)	decrease ^F			✓
Wandoo woodland over dense low sedges of <i>Mesomelaena preissii</i> on clay flats (P2)	decrease ^R	✓		
Wooded wetlands which support colonial waterbird nesting areas (P2)	stable	✓		

There was no change to the number of TECs listed in the FMP area since the plan began, as there was no legislative mechanism in place to list TECs. The Department continued to update the list of PECs, with 13 added since 2013.

What contributed to this rating?

- Vegetation condition was generally maintained where active management, such as weed control and infill planting, was undertaken.
- Decreases in vegetation cover index were largely attributed to fire, although drought and declining rainfall, *Phytophthora* dieback, grazing by animals (including rabbits) and pressure from development and urbanisation also contributed. Some of these impacts cannot be readily managed by the Department, including those attributed to climate change and urban development.

Commission recommendation

The Commission acknowledges the challenges of managing TEC and PECs across the FMP area with the significant pressures brought about through climate change related impacts.

The Commission notes that the KPI required the Department to consider the condition of prioritised TECs and PECs as identified in regional nature conservation plans and that these plans did not appear to adequately consider the requirements of this KPI.

Recommendation 3: That the measurement protocols for the KPI for threatened ecological communities be reviewed to clarify the methodology to be applied for the end of term performance assessment report to provide clear links to manageable significant pressures on ecological communities by January 2020.

Proposed management response

- The Department will further develop standardised methods for monitoring the condition of TECs and PECs, and through reviews of the regional conservation plans, undertake further work to prioritise which ecological communities are most in need of management action. This work will inform amendments to the measurement protocols for threatened ecological communities.
- The Department will continue to monitor the condition of and threats to TECs and PECs and will implement actions to mitigate or manage threats, where feasible.

2.3 KPI 3 Ramsar and nationally listed wetlands

KPI	Performance target	Achievement	C
3	The target condition of Ramsar and nationally listed wetlands as identified in the relevant regional nature conservation plans.	↓	H

Status

- The ecological characters of designated Ramsar wetland sites and the criteria that they were recognised and listed for have not changed during the reporting period.
- All listing criteria have been maintained for the five sites designated under the Ramsar Convention.
- Up to one third of limits of acceptable change (LAC) are being regularly exceeded in three Ramsar sites (Table 3): Forrestdale and Thomsons Lakes (33 per cent), Becher Point (31 per cent) and Peel-Yalgorup (30 per cent). Twelve per cent of the limits of acceptable change were exceeded at the Vasse-Wonnerup site, while nine per cent were exceeded at Muir-Byenup.

What contributed to this rating?

- Alteration of processes that support wetland biota, such as hydrological regimes and water quality, has resulted in deteriorating wetland condition. Geohydrology, catchment land uses and other pressures, such as loss of surrounding habitat and vegetation, weed and feral animal invasion and the incidence of bushfires, further influences wetland condition.
- The influence of a drying climate is evident across all wetlands. Those wetlands in proximity to urban areas also show declining condition in response to factors including eutrophication, groundwater abstraction, unmanaged access and the introduction of weeds.

Table 3: Summary of influences on the condition of Ramsar wetlands.

RAMSAR wetland	LAC regularly exceeded	Comments
Becher Point	4/13	LAC exceeded for fire frequency, water level, nitrogen and phosphorus. Groundwater decline and elevated nitrogen and phosphorus to the north east associated with abstraction and fertiliser use. Uncontrolled vehicular access is spreading weeds.
Forrestdale & Thomsons Lakes	6/18	LAC exceeded for annual maximum water depth, period of inundation / drying, salinity, nutrients and waterbirds. Both lakes drying for longer periods each year leading to spread of opportunistic plant species on lake bed. Drying climate and altered water regimes arising from adjacent urbanisation are key threats.
Peel-Yalgorup	11/37	LAC exceeded for salinity, chlorophyll a, nutrients, waterbirds, littoral vegetation and phytoplankton. Salinity continually rising in Yalgorup lakes - potential impact on thrombolite communities. Fish kill events most notable in Serpentine and Murray rivers as a result of downward trend in dissolved oxygen. Reduced inflows.
Vasse-Wonnerup	1/8	LAC exceeded for total phosphorus. Fish deaths continue to occur in inlet. Salinity in Wonnerup Estuary rises to 60ppt in late summer and 100ppt in the Vasse Estuary or > 3 times sea water concentration. Waterbird LACs are being met most years.
Muir-Byenup	2/22	LAC exceeded for water depth (drying out) and pH in Tordit Gurrup 2013-2017 due to reduced rainfall in the catchment and groundwater discharge. Significant drying of wetlands, most heavily impacting lakes.

Commission recommendation

The Commission acknowledges the challenges of managing Ramsar and nationally listed wetlands in areas of high population growth and increased development and reduced water availability due to the impacts of climate change.

The Commission notes that the KPI required the Department to consider the target condition of Ramsar and nationally listed wetlands as identified in the relevant regional nature conservation plans; these plans did not appear to specifically consider the requirements of this KPI.

Recommendation 4: That the measurement protocols for the KPI for Ramsar and nationally listed wetlands be reviewed to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between condition targets and the pressures on prioritised Ramsar and nationally listed wetlands by January 2020.

Proposed management response

The Department in collaboration with other Government agencies will continue to undertake management actions to mitigate pressures on wetland condition including:

- (i) flow regulation;
- (ii) water supplementation at Thomsons Lake and investigations for this intervention at Forrestdale Lake;

(iii) weed control at Becher Point, Forrestdale and Thomsons Lakes, Peel-Yalgorup and Vasse-Wonnerup systems;

(iv) catchment vegetation management at Muir-Byenup, Peel-Yalgorup and Vasse-Wonnerup systems; (v) fertiliser and drainage management in the Peel-Harvey system; and

(vi) supporting fishing regulation for the Peel-Harvey Estuary System.

Prioritisation of management and mitigation actions will occur through reviews of regional conservation plans that will inform amendments to the measurement protocols for Ramsar and nationally significant wetlands.

2.4 KPI 4 Threatened flora

KPI	Performance target	Achievement	C
4	(Change in flora populations for species) defined in the relevant regional nature conservation plans.	—	L

Status

Within the FMP area, the number of flora species listed as threatened increased from 144 in 2013 to 147 in 2017, with 697 species on the priority flora list in both 2013 and 2017 (Table 4). However, an increase in the number of listed species is not necessarily an indication of the overall state of flora having declined; rather, a species may have been listed because new knowledge has been collected that allows its conservation status to be more clearly defined or it may have been listed because of taxonomic revision.

Between 2013 and 2017, two flora species were removed from the threatened species list (*Myriophyllum trifidum* and *Asplenium obtusatum* subsp. *northlandicum*) and three species were added to the list (*Austrostipa jacobsiana* and *Gastrolobium argyrotichum* as critically endangered and *Austrostipa bronwenae* as endangered). *Scholtzia* sp. Bickley (W.H. Loaring s.n. PERTH 06165184) was added to the list of species presumed to be extinct in 2014, as it was known from only a single record near Bickley in 1920 and extensive survey in and around Bickley and the broader Perth hills area found no subsequent trace of the species. Listing this species as presumed extinct is not related to management actions delivered under the FMP.

Table 4: Listing status of threatened flora species at 2013 and 2017.

Region	Year	Total number of species listed	Critically endangered	Endangered	Vulnerable	Extinct	Priority
Swan	2013	364	21	21	27	2	293
	2017	366	21	23	26	3	293
South West	2013	269	22	18	12	2	215
	2017	269	22	19	12	2	214
Warren	2013	212	7	8	8	0	189
	2017	214	6	10	8	0	190

Given the large number of threatened flora, changes in population size were assessed for species within the FMP area that were listed as critically endangered in 2017 and where sufficient suitable data was available, noting that survey and management effort is not consistent for all threatened flora species or individual populations of a particular species. Of the 42 species analysed, 14 recorded a decrease in population size over the 10-year period from 2008-2017. Twenty species had stable population sizes and the remaining eight species showed an increase, the latter being influenced by improved and dedicated survey effort to understand population dynamics of priority species.

What contributed to this rating?

The changes in population size can be the result of a range of factors. For species that are fire respondents, such as *Calytrix breviseta* subsp. *breviseta*, population increases were because of immediate recruitment after fire. However, in other species, like *Synaphea stenoloba*, a fire ephemeral, populations declined as the time since fire increased. For some species further survey resulted in discovery of new populations and the overall population numbers increased.

Commission recommendation

The Commission acknowledges that there are a range of factors that may influence changes in threatened flora population sizes. It also notes that the KPI required the Department to consider changes in flora populations as identified in regional nature conservation plans and that these plans did not appear to adequately consider the requirements of this KPI.

Recommendation 5: That the measurement protocols for the KPI for threatened flora be reviewed to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between condition targets and the pressures on relevant threatened flora by January 2020.

Proposed management response

The Department will continue to implement survey and monitoring of threatened flora populations and review draft regional conservation plans to ensure that prioritisation of management actions within and across regions, including threat abatement, focusses on the highest priority species, communities and threatening processes. Together with the refinement of monitoring methodologies, this process will inform amendments to the measurement protocols and reporting on condition targets for threatened flora.

2.5 KPI 5 Threatened fauna

KPI	Performance target	Achievement	C
5	(Change in fauna populations for species) defined in the relevant regional nature conservation plans.	↘	M

Status

Within the FMP area, the number of fauna species listed as threatened or specially protected increased from 112 in 2013 to 120 in 2017, which included four species being listed as conservation dependent when this category was introduced in 2017 (Table 5). Three species were added to the list – *Galaxiella nigrostriatal* (black-striped minnow) as endangered, *Lepidogalaxias salamandroides* (salamander fish) as endangered, and *Westralunio carteri* (Carter’s freshwater mussel) as vulnerable. In the same period, two species were removed from the threatened and specially protected fauna list (*Morelia spilota imbricata* (carpet python) and *Aspidites ramsayi* (Woma)).

The total number of species in each category in Table 5 is not necessarily simply an addition of the numbers of species in each of the three FMP regions, as some species occur in more than one region. There have also been changes to the conservation category of some species during the reporting period. For example, the conservation status of the Walpole burrowing crayfish changed from vulnerable to endangered in 2017.

One species, *Bettongia lesueur graii*, was added to the presumed extinct fauna list in 2015 following a review of the Mammal Action Plan. There was a single record in the FMP area of a very old burrow in the Muja area; however, listing this species as presumed extinct is not related to management actions delivered under the FMP.

Table 5: Listing status of threatened or specifically protected fauna species at 2013 and 2017.

Region	Year	Total number of species listed	Critically endangered	Endangered	Vulnerable	Extinct	Priority	Conservation dependent
Swan	2013	79	3	11	22	2	41	N/A ⁵
	2017	76	4	15	17	2	35	3
South West	2013	62	5	10	17	4	26	N/A
	2017	71	6	15	17	5	25	3
Warren	2013	47	2	6	14	2	23	N/A
	2017	60	3	15	17	2	21	2
Total in FMP area	2013	112	7	16	28	7	54	N/A
	2017	120	8	25	25	8	50	4

The Western Shield program, which aims to protect threatened fauna from foxes and feral cats was applied over approximately 82 per cent of the area managed by the Department in the FMP area. Four medium-sized mammal species have been monitored over the long-term under the program, including common brushtail possum, woylie, chuditch and quenda. While not all threatened, these species are relatively easy to capture using simple techniques and are known to respond well to feral predator management and so are considered 'indicator' species. The monitoring results indicate that there were high annual fluctuations in the relative abundance of populations of all four species across the FMP area. The results from the current reporting period (2014 to 2017) suggest a decreasing trend for the common brushtail possum and chuditch, with woylies and quenda currently remaining stable once annual fluctuations are considered.

⁵ The category of 'conservation dependent' was introduced in 2017 to align the categories in the WA threatened fauna list with those recognised internationally and nationally.

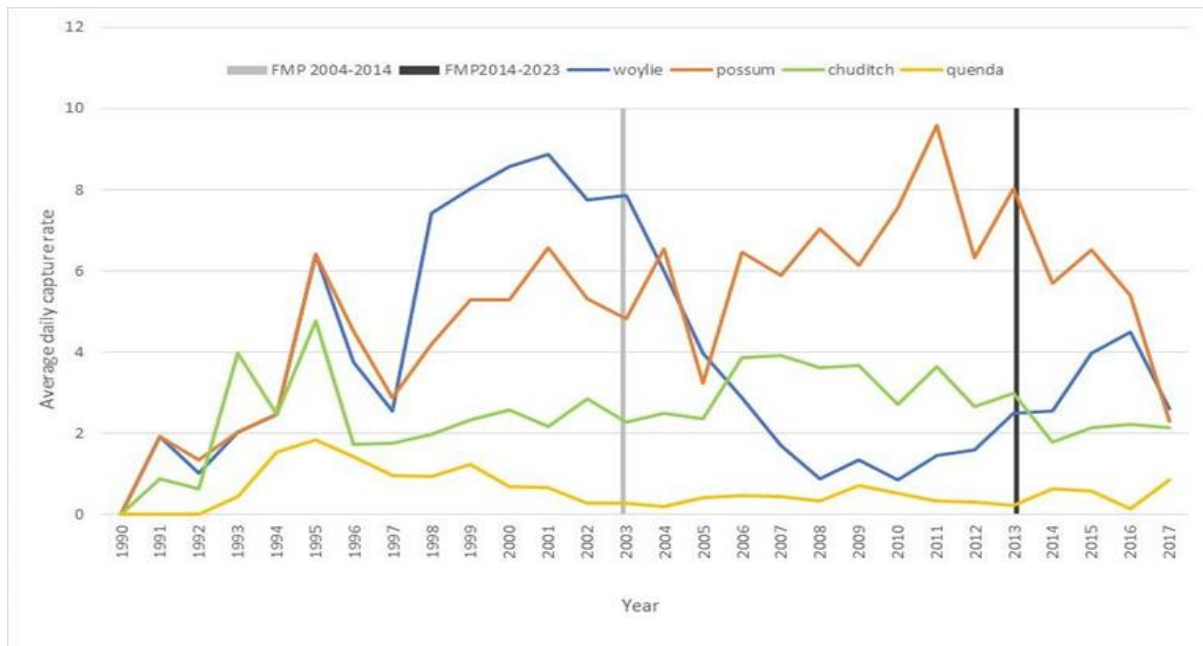


Figure 4: Average daily capture rates of key Western Shield indicator species monitored within the FMP area between 1990 and 2017.

Long-term monitoring of mammals in the Upper Warren area (within the FMP area) has revealed marked changes in abundance, including:

- an increase to the late 1990s and subsequent decline in around 2000 of quenda, woylies and western ringtail possums;
- the decline of brush-tailed phascogales, two species of dunnart, southern bush rat and western brush wallaby; and
- increases of brushtail possums, tammar wallabies and chuditch since the mid-2000s (Wayne *et al.* 2018).

Additional species identified as priorities in the FMP area showed varied population trends during the reporting period including:

- the minimum population count, through the Great Cocky Count, for Carnaby's cockatoo in the Greater Perth-Peel Region in 2017 was 10,248, which was similar to the 2016 count and around twice the average count for 2010-15. The estimated current rate of decline in the number of Carnaby's cockatoos is 11 per cent per year. However, this trend estimate should be treated with some caution, given the 'snapshot' sampling method and the need to consider the assumptions underlying both the survey method and trend analysis;
- stable population of western swamp tortoise as a result of significant management activities to mitigate population impacts;
- white-bellied frog population abundance declined with over 60 populations becoming extinct, while the number of populations of orange-bellied frogs remained relatively stable; and

- the species diversity of migratory shore birds recorded in the Department's South West Region declined since 2014; however, the number of birds recorded for those species that are still present in the region remained relatively stable.

What contributed to this rating?

The similar rates and magnitudes of decline of native taxa suggest similar causes or processes may be common across the species. The Western Shield program is contributing to the continued persistence of populations of threatened fauna in the FMP area, with feral cats and foxes considered the most likely factor in recorded species declines. Trial baiting in selected areas to protect threatened fauna from feral cats commenced in the reporting period. Areas subject to disturbance events including fire and timber harvesting can experience an increase in predator activity and as such native fauna populations within these areas are at increased risk of predation. For timber harvesting, additional baiting is undertaken after disturbance to mitigate this risk and after fire it may be undertaken depending on the risk.

Land clearing and timber harvesting activities can cause localised impacts on fauna abundance and population stability. While land clearing will permanently remove habitat and so displace species from an area permanently, there is no evidence to suggest timber harvesting has long term impacts on population viability of temporarily displaced species such as black cockatoos and western ringtail possums (Christensen 1992, Wayne *et al.* 2000, Wayne *et al.* 2006). A drying climate and subsequently changing ecosystems also affect species populations, along with additional pressures from invasive species and disturbance activities, including fire.

Commission recommendations

The Commission notes that population declines in brush-tailed phascogale, two species of dunnart, southern bush rat, western brush wallaby, Carnaby's cockatoo, and white-bellied frog were not attributed to a particular threat category or cause to assist in ascertaining whether any further specific measures may be required.

In this FMP there was acknowledgement that the conservation of some fauna species may require specific measures and modifications were recommended to enhance biodiversity and other outcomes through revision of relevant documents pertaining to silviculture and to fire management. This would ensure that where practicable, local scale operations consider appropriate measures to minimise loss of legacy habitat elements (such as tree hollows and fallen, hollow logs). The information provided for the mid-term review is deficient for assessment for these particular species.

Recommendation 6: That the condition of key fauna species in the FMP area which have recovery plans in place be reviewed by the Department to determine if the actions in the recovery plans have been implemented, and if this implementation has been effective.

Recommendation 7: That the measurement protocols for the KPI for threatened fauna be reviewed by the Department to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between condition targets and the pressures on relevant threatened fauna by January 2020.

Proposed management response

- The Department will continue to implement the Western Shield program to protect threatened fauna from foxes, together with the FPC, undertake additional baiting after disturbance activities and refine implementation of Eradicat® for control of feral cats so this can be integrated into Western Shield.
- The Department will continue to develop partnerships and programs with recreational hunting groups to augment the resources available for targeted pest animal control.
- The Department is developing improved monitoring, data collection and storage and reporting methodologies and systems to support improved prioritisation of resources towards the highest priority species, through reviews of regional nature conservation plans. This will inform amendments to the measurement protocols for threatened fauna.
- The Department will continue to investigate the causes of fauna population declines with a view to identifying practicable management interventions to reverse these trends.

2.6 KPI 6 Distribution of fire age

KPI	Performance target	Achievement	C
6a	Conformance to the theoretical distribution of time since fire for the whole of forest.	—	H
6b	Conformance to the theoretical distribution of time since fire for major LMUs.	—	H

Status

- The target distribution is a theoretical negative exponential function that is based on inputs relating to the life history attributes and ecological requirements of native vegetation (McCarthy *et al.* 2001). The degree to which the fuel age distribution conforms to the theoretical negative exponential curve gives an indication as to how well the Department's fire management program is achieving biodiversity goals of the plan.
- At the whole of forest scale, distribution of forest fuel age ranged from zero to greater than 45 years with some increases in the younger fuel ages due to significant landscape scale bushfires from the early 2000s and concerted effort to sustain prescribed burning achievements (Figure 5). Structural diversity was thus maintained at the whole of forest level.
- Across the landscape, most land management units (LMUs)⁶ have a broad distribution of fuel ages. However, there were areas with over representation in certain fuel age categories for some LMUs, including Central Karri (skewed to fuels older than 13 years reflecting areas of karri regrowth) and the Southern Karri and Redmond Siltstone Plain LMUs (high proportion of younger fuels due to recent large bushfire events).

⁶ Land management units are an agglomeration of vegetation complexes and ecological vegetation systems, as defined and mapped by Mattiske and Havel (2002), to form more compact management units that recognise the underlying ecological characteristics.

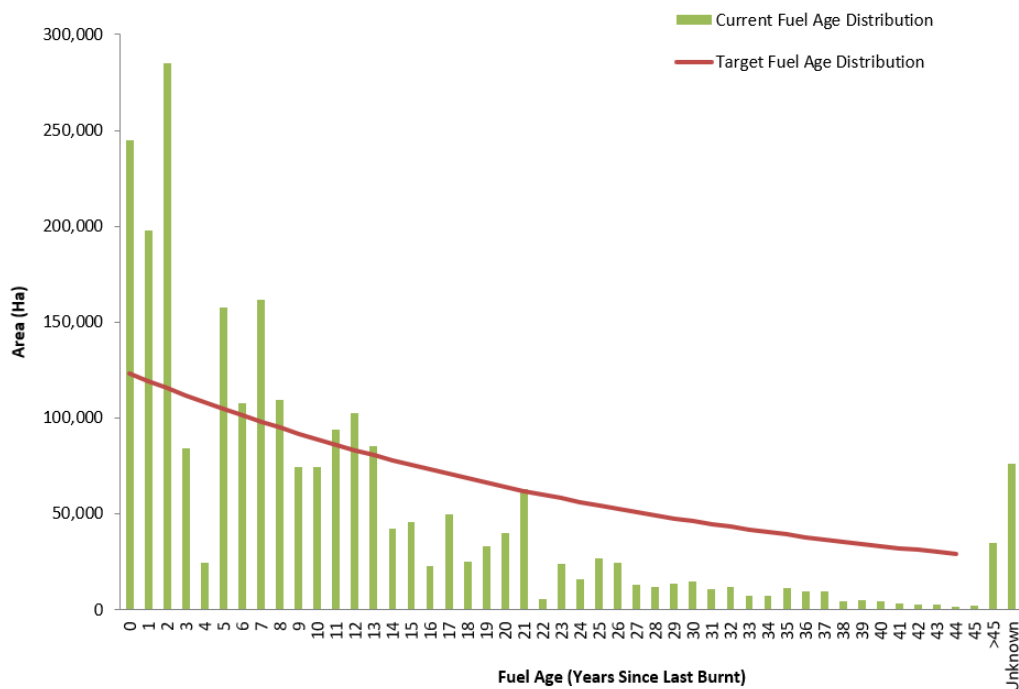


Figure 5: Fuel age distribution in the FMP area (July 2017).

What contributed to this rating?

- At the whole of forest scale, the outcome has been influenced by more landscape-scale bushfires since 2000, limited prescribed burning over previous decades and changing climatic conditions.
- Large bushfires had significant impacts on several LMUs, notably Central Jarrah, Northern Upper Collie, Southern Dunes, Southern Karri and Southern Swampy Plain.
- More recently, application of additional resources has allowed more flexible approaches to prescribed burning and resulted in improving achievement over the last 2-3 years. The impact of this improvement was most notable in Monadnocks Upland Valleys, North Western Jarrah and Northern Sandy Depression.
- The outcome for both Northern and Central Karri LMUs is primarily due to the existence of extensive areas of karri regrowth that is susceptible to fire until about 25 years old, for Southern Karri more than half consists of 2-year-old fuel arising from a major bushfire, and several LMUs (Redmond Siltstone Plain, South Eastern Uplands and, to an extent, Southern Hilly Terrain) have adjoining land tenures and uses that require burning to be tailored to strategic protection.

Commission recommendation

The Commission notes that the Department applies zoning of fuel management intent within the FMP area to guide annual prescribed burning targets in accordance with proximity to concentrations of adjoining human populations and other assets and to

identify the risk posed by bushfires to those assets. Whilst this adds complexity to the planning of prescribed burning programs the Commission views this as an important aspect to those programs to achieve improved community protection.

The Commission recognises the implications of increasing landscape scale bushfires and acknowledges the increased effort in prescribed burning. The Commission is mindful however that, as detailed in KPI 1, there is uncertainty around the health of forest ecosystems with landscape scale changes observed in vegetation density. How this change in vegetation density relates to the goals for vegetation structural diversity and the health and resilience of forest ecosystems should be clarified.

Recommendation 8: That the performance target used by the Department for the KPI for distribution of fire age be reviewed in consultation with the Commission prior to the next FMP.

Proposed management response

The Department will continue to:

- maintain prescribed burning programs to create a landscape-scale mosaic to provide protection against large bushfires;
- maintain prescribed burning programs in karri regrowth forest to address over-representation of moderate fuel ages; and
- seek to better integrate planning of prescribed fire and timber harvesting to facilitate the use of prescribed fire in regrowth forests.

2.7 KPI 7 Effectiveness of fire planning and management

KPI	Performance target	Achievement	C
7.1	90 per cent of prescribed burns that meet their stated objective.	—	H
7.2	Completion of the relevant regional fire management plans by mid-term.	↗	H

Status

- Approximately a third of 2016-17 burns had information reported against the success criteria in the prescribed fire plan. Sixty-eight per cent of these fully achieved the criteria, 31 per cent partially achieved the criteria and one per cent did not achieve the criteria, as shown below.
- The number of current Regional Fire Management Plans across the area covered by the FMP has increased from one to two of the three regions over the reporting period.

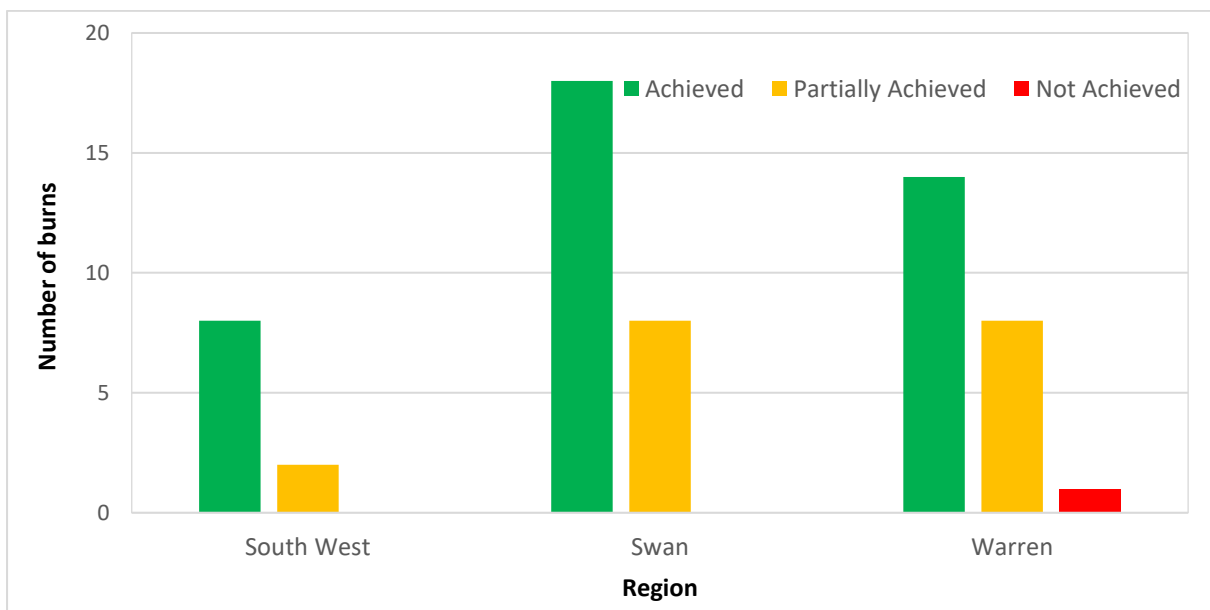


Figure 6: Achievement of post-burn success criteria for 2016-17.

What contributed to this rating?

The number of burns not completed and requiring further ignition contributes to the low proportion of burn plans with reported success criteria. The ability of the current system to differentiate information between reporting periods is also limited and this will continue to pose a challenge for future reporting.

Commission recommendation

The Commission acknowledges the effort and achievements by the Department in meeting the performance target for fire planning and management. The evidence for the consistent achievement of mosaic burning outcomes within burn cells is noted.

Recommendation 9: That the Department review KPI 7 following the mid-term review as detailed in the FMP in consultation with the Commission by January 2020.

Proposed management response

The Department is in the process of finalising a framework for the management of risks associated with bushfire. This framework includes new performance measures for the prescribed burning program and, to facilitate these, a revised format and content for RFMPs will be developed.

The Department will continue to:

- develop measurable and relevant success criteria that can be reported against in a timely manner, where applicable with the Commission; and
- complete Regional Fire Management Plans to guide decision making and operations.

2.8 KPI 8 Weeds, pests or disease pathogens

2.8.1 Weeds

KPI	Performance target	Achievement	C
8.1	(Distribution or density of priority weeds) as defined in the relevant regional nature conservation plans.	↗	M

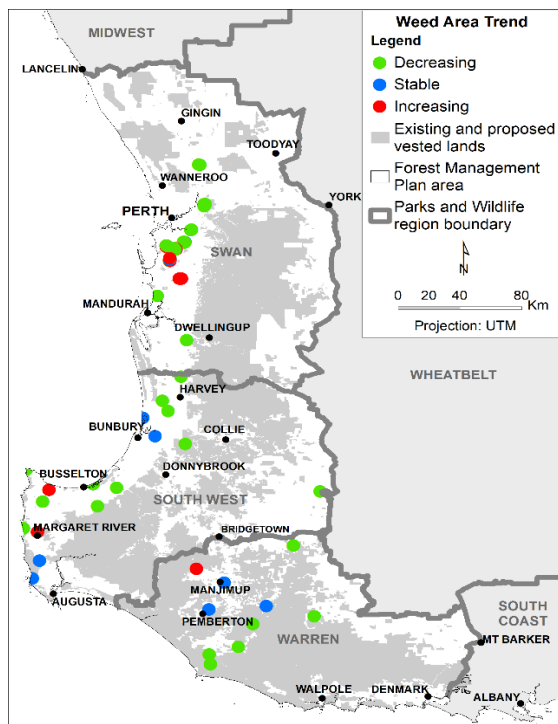
Status

- For areas where consistent, long-term management actions were applied, the condition of key conservation values under pressure from weeds generally improved (Figure 7b) and the area (Figure 7a) and density of priority weeds generally decreased (Figure 7c).
- Where priority weeds were managed to protect key conservation values, the condition of the conservation value improved, and adjacent areas were protected from weeds.
- Where no management actions, or inconsistent management actions were applied, the density of weed species generally increased and condition of key conservation values generally declined. In addition, new infestations and/or species were recorded across the FMP area each year.
- Data from FORESTCHECK grids located in State forest indicates that weed numbers were generally low and weeds tended to be herbaceous annuals that increased immediately after harvesting and burning then decreased as the native vegetation regenerated. However, within small forest areas surrounded by agriculture and adjacent to roads, weed infestation was observed. Similarly, small and isolated conservation reserves in heavily cleared areas on the Swan Coastal Plain and Avon Wheatbelt often have high and increasing weed loads, when unmanaged.

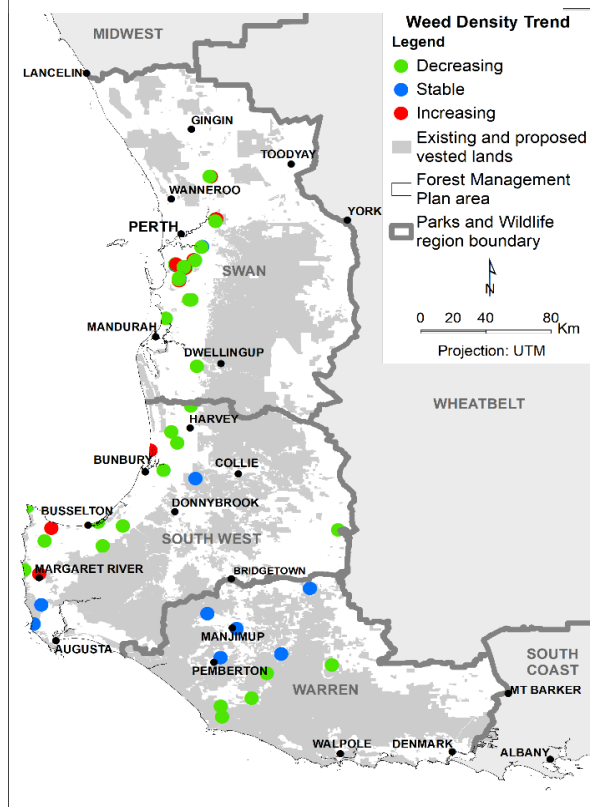
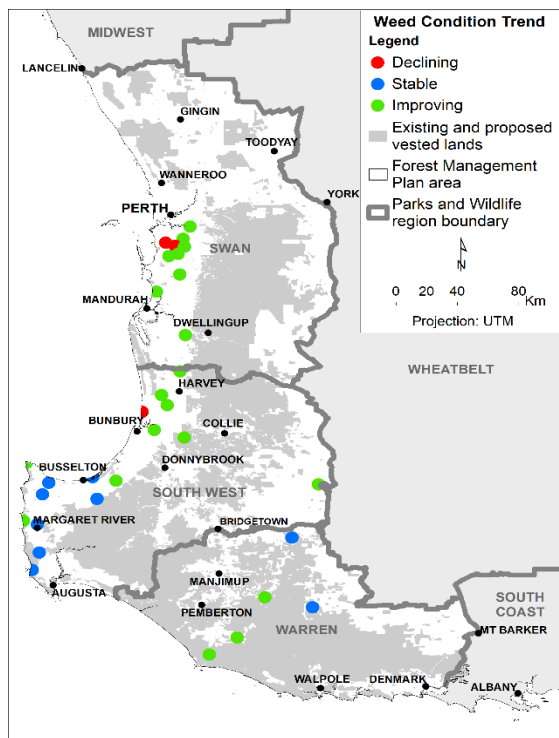
What contributed to this rating?

- The prioritisation process used for management of weeds has ensured that available resources are applied to effectively manage the most important species and assets.
- Smaller reserves are more prone to weeds due to external influences, and fragmentation is an over-riding factor that is beyond the control of the Department and Commission.

(a) Area trend



(b) Condition trend



(c) Density trend

Figure 7: Trend in (a) vegetation condition on monitoring sites impacted by weeds, (b) area occupied by weeds on these sites and (c) the density of weeds on these sites.

Commission commentary

The Commission acknowledges the overall positive trend for the effective management of priority weeds. However, there is limited information provided for this KPI on the prioritisation of weed management as it relates to the regional nature conservation plans (see recommendation 10).

Proposed management response

The Department will continue to:

- review and apply its weed prioritisation process, including the adoption of the Regional Priority Weeds and Locations process;
- standardise the weed data collection methodology and map priority weeds using the Weed App to enable management effectiveness to be evaluated;
- implement a minimum level of monitoring to assess changes in condition of conservation values; and
- allocate resources to priority weeds and sites.

2.8.2 Pests

KPI	Performance target	Achievement	C
8.2	(Distribution or density of priority pests) as defined in in the relevant regional nature conservation plans.	—	L

Status

- Pest animals targeted by control programs in the FMP area include pigs, goats, foxes, feral cats and deer.
- The Department uses a range of methods for monitoring and control of pests, including significant aerial baiting programs for foxes, some aerial and ground baiting for feral cats, remote camera deployment for monitoring purposes and hunting and trapping programs. The methodology is dependent on the pest species being targeted, the location and desired outcome.
- Two of the major pest animals in the FMP area are foxes and feral cats because of their impact on native fauna through predation. The Western Shield program, which seeks to control these pest species, is applied over approximately 82 per cent of the FMP area.
- Feral cat and fox activity is greatest, and native species are most vulnerable, following disturbances such as timber harvesting or fire. For timber harvesting, additional baiting is undertaken after disturbance to mitigate this risk and after fire it may be undertaken, depending on the risk.
- Feral pigs present a range of risks to values in the FMP area, including the spread of dieback disease and other diseases and physical damage to wetlands and riparian soils and vegetation.
- Standard monitoring is being developed to determine pest animal numbers and effectiveness of control effort.
- The FPC has established a network of camera traps within the karri forest available for timber harvesting to monitor foxes and feral cats as well as the presence of native species. This data is provided to the Department.

What contributed to this rating?

- Regional control effort varies for species targeted and number of animals dispatched depending on the type of activity, seasonal variation and number of times carried out in a year.

Commission recommendation

The Commission notes that there is limited information provided for the pest species management KPI targets as they relate to the regional nature conservation plans.

Recommendation 10: That the Department's measurement protocols for the KPI for weeds and pests be reviewed to clarify the methodology to be applied for the end of term performance assessment report of the FMP to provide clear links between performance targets and the pressures from relevant priority weeds and pests by January 2020.

Proposed management response

- The Department is developing improved monitoring, data collection and storage and reporting methodologies and systems to support improved prioritisation of resources and assessment of management effectiveness, including through reviews of the regional conservation plans. This will include development and application of a framework to prioritise, monitor and report on pest animals similar to that used for weeds, through the regional nature conservation plans.
- The Department will continue to implement the Western Shield program, and together with the FPC will undertake additional baiting after disturbance activities and refine implementation of Eradicat® for control of feral cats.
- The Department will continue to develop partnerships and programs with recreational hunting groups to augment the resources available for targeted pest animal control.

2.8.3 Diseases

KPI	Performance target	Achievement			C
8.3	(Distribution or density of priority diseases) as defined in the relevant regional nature conservation plans.		↘		M
8.4a	No planned operations undertaken without an approved hygiene management plan – timber harvesting.			↘	H
8.4b	No planned operations undertaken without an approved hygiene management plan – other disturbance activities.		↗		M
8.4c	Less than three per cent of uninfested protectable area infested as a result of management activities – timber harvesting.			↘	H
8.4d	Less than three per cent of uninfested protectable area infested as a result of management activities – other disturbance activities.			–	L

Status

Priority diseases are myrtle rust, which has not been identified in the FMP area, and *Phytophthora* dieback.

Distribution of *Phytophthora* dieback

At the end of 2016, 28 per cent of Department managed land in the FMP area was comprehensively mapped for *Phytophthora* dieback occurrence. This mapping has decreased the area for which the Department has no information and improved knowledge of an areas infestation status by approximately 10,000 hectares per year. Of the area mapped for occurrence, 31 per cent was infested. The proportion of forest infested was lower in Disease Risk Areas (DRA) at 16 per cent and Priority Protection Areas (PPA) at <1 per cent compared to 49 per cent outside DRA and PPA.

Effectiveness of hygiene management planning

Timber harvesting operations

- All twenty-one operations checked in native forest had an approved hygiene management plan, while one operation associated with plantation operations did not.
- The total area at risk of *Phytophthora* dieback from new infestations was 2.5 per cent of the total 6,750 hectares sampled. Eighty-nine per cent of protectable areas sampled had no new infestations or extensions and 11 per cent had new infestations or extensions confirmed.
- Seventy-four hygiene breaches (i.e. unauthorised activity such as vehicles crossing from infested into uninfested areas at a non-designated point) were identified. Most hygiene management breaches related to ineffective road closures. There were 164 road closures inspected and 53 per cent (87) were found to be ineffective largely due to unauthorised public access occurring despite the closure being installed correctly.

Other disturbance activities

- Across the range of operations sampled (construction of access tracks for prescribed burning, site monitoring and development), only 10 out of 34 operations

had an approved Hygiene Management Plan (HMP) available, although many operations had a less formal plan in place for hygiene management.

- Three new dieback infestations were found.
- Nine hygiene breaches were recorded, mostly related to ineffective road closures.

What contributed to this rating?

Distribution of *Phytophthora* dieback

The lower occurrence of *Phytophthora* dieback in DRA is attributed to the lesser occurrence when it was proclaimed in the 1970s and management measures put in place to protect these areas since their proclamation. The lower occurrence in PPA is because these areas were carefully selected with a priority for least dieback occurrence.

Effectiveness of hygiene management planning

- Roading activities and access associated with disturbance activities were considered to be the main causes for spread of disease.
- Ineffective road closures were the most significant factor.
- Unauthorised access to DRA occurred across the FMP area.

In response to hygiene management issues identified in the *End-of-term audit of the FMP 2004-2013* (Conservation Commission of Western Australia, 2012), the Department adopted 39 recommendations for improving disease management. The implementation of these recommendations is well underway, with those considered the highest priority being implemented first. These included:

- updating the policy and management guidelines;
- provision of new guidance for managers to assist in prescribing appropriate levels of protection for different threat and asset categories;
- increased training in disease awareness and management; and
- new requirements for those entering onto Department managed lands to have Green Card qualifications to ensure disease management is well understood.

Since 2014, over 750 staff and contractors received Green Card training in dieback awareness and basic hygiene, and over 130 staff received training in the development of HMPs. The Enhanced Prescribed Burning Program also facilitated increased mapping of *Phytophthora* dieback, which underpins the development of HMPs for prescribed burn activities. Improvements to disease management will take time to be reflected in formal studies of effectiveness in reducing spread.

Commission recommendations

The Commission acknowledges the improvements in hygiene management over time which have clearly resulted in significantly reduced rates of spread especially in Disease Risk Areas.

Recommendation 11: That the Department undertakes an investigation to improve the effectiveness of road closures to reduce the impact of unauthorised road access on compromising the disease status of protectable areas.

Recommendation 12: That the Department provides an annual consolidated compliance monitoring report on the number of operations with a Hygiene Management Plan and the implementation of those plans.

Proposed management response

The Department will:

- maintain its systems to support the continued work of skilled interpreters in dieback assessment and mapping;
- evaluate aerial remote sensing methods to supplement on-ground assessments by interpreters;
- continue to refine its management priorities considering threatening processes including dieback for integrated landscape scale management of conservation values. PPAs, DRA, area management and other plans will help inform this;
- continue its roll-out and implementation of the *Phytophthora Dieback Management Manual*, through the delivery of training, support to staff and monitoring; and
- conduct a specialised review into the effectiveness of road closures with the FPC to reduce the impact of unauthorised road access further compromising the disease status of protectable areas.

2.9 KPI 9 Level of soil damage resulting from timber harvesting

KPI	Performance target	Achievement	C
9	Soil damage not to exceed prescribed maximum levels for 95 per cent of harvest cells surveyed, except where the prescribed levels cannot be achieved with the application of good harvest practices.	—	H

Status

- A majority of operations were conducted within prescribed maximum levels of soil damage (Table 6).
- Soil damage in excess of prescribed levels was caused by the increased movement of heavy vehicles, in all seasons, associated with the felling and extraction of timber.

Table 6: Summary of results from monitoring of soil disturbance.

Year	2014	2015	2016	2017 (to July)	Total / average
Number of surveys conducted	54	42	32	17	145
Moderate soil disturbance (% of surveys achieving target)	80	81	69	100	80
Severe soil disturbance (% of surveys achieving target)	87	83	56	94	80

What contributed to this rating?

- The main contributing factors where limits were exceeded were that the volume of wood removed including increased residue and other bole volume required significant vehicle traffic, variable application of a structured pattern of extraction, including use of old tracks and treatments to protect soil.
- The result in 2016 is considered to be due to the FPC trial of different extraction techniques, constrained access to suitable areas and the early implementation of operations to utilise small diameter trees in heavily stocked regrowth stands.
- Increased vehicle traffic occurred in response to the reduction in hand falling operations for safety reasons and a commensurate increase in falling by harvesting vehicles.

Commission commentary

The Commission acknowledges that the Department and the FPC are committed to continuing to collaborate to refine and improve management practices to meet the KPI target for soil damage for timber harvesting.

Proposed management response

- The Department and the FPC will continue to plan coupes to utilise existing tracks and areas of disturbance, actively monitor disturbance operations and communicate results to each other, and FPC will communicate results to contractors.
- All instances of excessive disturbance will be followed up by the FPC to identify causes and improve management practices.
- The Department will continue to work with the FPC to develop guidance for high utilisation operations, further clarify the interpretation of good harvest practices in instances where soil disturbance thresholds have otherwise been exceeded.
- The FPC will ensure harvest contractors are trained in the requirements for minimising soil disturbance.

2.10 KPI 10 Stream condition and groundwater level

KPI	Performance target	Achievement	C
10.1	No gauging stations with annual flow weighted mean salinity that is not fresh as a result of management activities.	—	H
10.2	No sites with a decline in streamflow as a result of management activities.	—	H
10.3	No decline in groundwater level as a result of management activities. No rise in groundwater level to the extent that it could lead to annual stream salinity not remaining fresh, as a result of management activities.	—	H

Status

- Streams in fully forested catchments remained fresh.
- Although streamflow and groundwater level continued to decline, these declines are not considered to be the result of management activities (Table 7).

Table 7: Summary of stream condition and groundwater level.

Performance entity	General trend	comments
Stream salinity	Steady	Stream salinity within fully forested catchments remains steady and fresh with annual flow-weighted salinity around 100-200 mg/L.
Streamflow	Decreasing	All catchments, except 2 along the south coast recorded reductions in annual streamflow.
Groundwater level	Decreasing	Most boreholes recorded a trend of declining groundwater level.

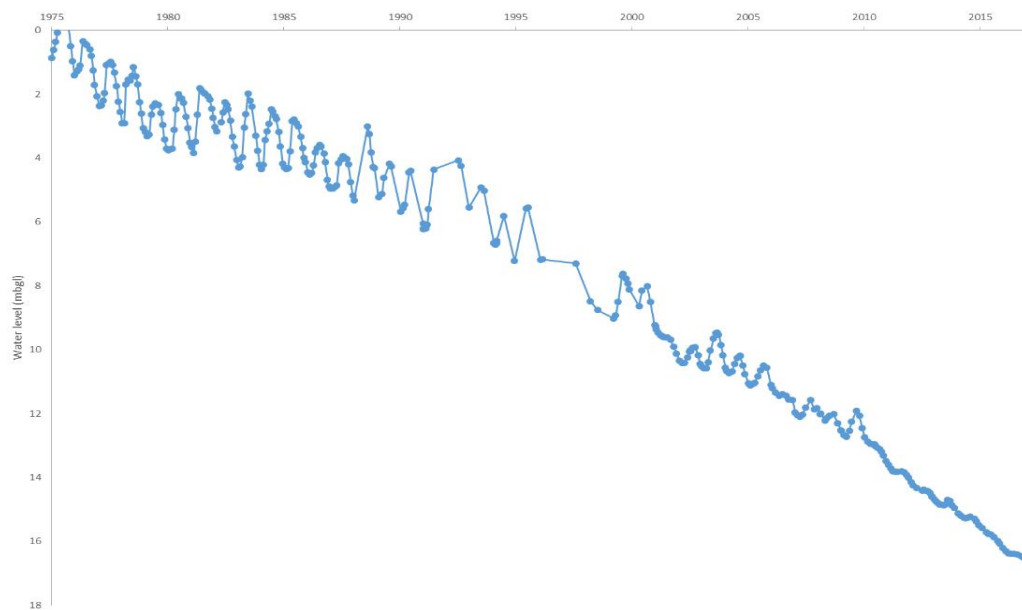


Figure 8: Depth to groundwater (metres below ground level) at Yarragil 4X (61418409) catchment from 1975 to 2017.

What contributed to this rating?

- The continued drying trend across the plan area is predominately responsible for the continued declines in streamflow and groundwater levels. The increase in streamflow along the south coast can be attributed to good rainfall during 2016.

Commission recommendations

The Commission notes the apparent impact of climate change on stream conditions in relation to flow rates and groundwater recharge. It also acknowledges that previous trials using silviculture treatments to reduce water demand from trees via transpiration through thinning had indicated a potential benefit to stream conditions in specific applications.

Recommendation 13: That the Department continue to investigate opportunities for improving stream conditions through cost-effective management activities.

Proposed management response

The Department will continue to investigate opportunities to achieve greater groundwater recharge and streamflow through cost-effective management techniques, including available silvicultural options.

2.11 KPI 11 Effectiveness of silviculture for water production

KPI	Performance target	Achievement	C
11	<ol style="list-style-type: none"> 1. Catchment management plans are prepared and approved for areas to be treated. 2. Compliance of treemarking, harvesting and related treatments with targets specified in the relevant guidance documents. 3. Streamflow is at least maintained, or the rate of decline is reduced as a result of treatment. 	Not applicable	H

Status

- No catchment management plans were required as no areas were proposed for treatment.

What contributed to this outcome?

- The lack of access to markets for other bole volume that would facilitate silviculture for water production has limited the uptake of this strategy.

Commission commentary

The Commission notes that this KPI was not required to be measured as no forest areas in this FMP had silviculture for water production applied. The Commission acknowledges that the reporting of this KPI for the remainder of the FMP period is dependent on economic factors that determine its application when appropriate.

Proposed management response

- The Department will continue to seek and support opportunities to implement silviculture for water production.
- The FPC will seek to secure access to markets for other bole volume to facilitate silviculture for water production.

2.12 KPI 12 Increased knowledge of trends in climate

KPI	Performance target	Achievement	C
12	Trend and knowledge report compiled at mid-term and used to inform reporting on achievement of KPI targets.	—	H

Status

Trends in climate: Bureau of Meteorology (BOM) records interpolated from 24 stations indicate the annual rainfall throughout much of the plan area during the five-year period 2011 to 2016 was markedly less than the averages recorded during 1991-2010, particularly north of Dwellingup and in an area south-west of a line from Bridgetown to Walpole (Figure 9).

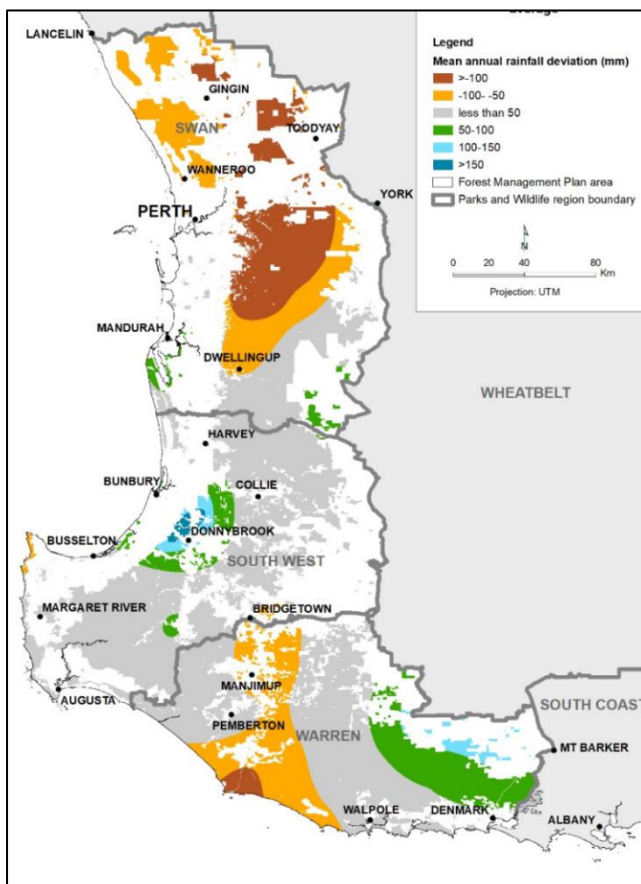


Figure 9: Deviation in the mean annual rainfall recorded during 2011-2016 from the average recorded during the period 1991-2010.

Average monthly temperatures during this period were higher in most months than the period 1991-2010. Comparison with the high severity-high impact (A1F1) CSIRO (2007) projections of climate for 2030, 2050 and 2070 at selected locations across the plan area suggests the temperatures recorded during 2011 to 2016 were similar to the projected values for 2030.

New knowledge gained on the impact of changing climate on values identified in the plan:

Improved knowledge on the potential impacts of climate change on forest values has continued to accrue through a range of sources, including published research conducted by the Department and other institutions, ongoing monitoring of landscapes, threatening processes and species, and the initiation of projects to track recovery of forest areas following drought and high intensity bushfire events. A broad range of collaborative research projects involving the

Department and examining climate impacts on species or communities were described in the published annual DBCA research report. For example, the impacts of declining streamflow on water values and aquatic biodiversity in the plan area was reported by Penniford *et al.* (2017). A progressive decline in freshwater aquatic ecosystems is considered likely due to the combined effects of reduced rainfall and in

some cases, increasing salinisation causing by historic clearing for agriculture. Hydrological modelling by Croton *et al.* (2015) investigated the relationship between forest density and leaf area in the northern jarrah forest to derive forest densities required for a particular level of streamflow.

Continuation of the FORESTCHECK program provided a sound basis to monitor the recovery of jarrah forest biodiversity following severe bushfire events. Further monitoring of the status of drought areas described by Matusick *et al.* (2012) refined the understanding of topographic and site characteristics associated with tree decline in the northern jarrah forest (Brouwers *et al.* 2013). Through this research, differences in the resilience of tree species to severe drought were quantified.

Bushfire in a drying climate presents a threat to a range of forest values. A collaborative project between the Department, CSIRO and BOM investigated the increased frequency of lightning events and the potential for increased fire prevalence in forest landscapes. Research by BOM contributed to improved understanding of the processes responsible for strong convective plumes associated with high intensity bushfires, and how the likelihood of these events may have changed during the past 30 years (Peace *et al.* 2017; Dowdy and Pepler 2018). The socio-economic values impacted by catastrophic bushfire events were illustrated by the Lower Hotham, O'Sullivan and Waroona bushfires in 2015 and 2016.

What contributed to this rating?

Enhancements by BOM to the coverage, resolution and accessibility of weather and climate data made high quality information available to interpret research and monitoring results, model potential impacts under a range of climate scenarios, and inform operational planning for activities such as prescribed fire and soil conditions for timber harvesting. The availability of improved resolution weather data enhanced the capability to undertake climatological studies at regional and continental scales.

The results of several major research and monitoring projects to inform climate change impacts, such as the hydrology and aquatic biodiversity studies, have been published since 2014, and have contributed to improved understanding of the regional impacts of climate change.

Commission recommendation

The Commission notes that observations of weather and climate data is closely aligned with predictive models on climate change used for the development of the FMP. Published research highlights the on-going impacts of a drying climate especially in relation to bushfire events and forest health.

Recommendation 14: That there is a continued focus of research towards understanding the implications of a drying climate on ecological function, biodiversity and forest health including consideration of treatments to improve the forests resilience in a future drier climate.

Proposed management response

The Department will continue to access up-to-date climate projection datasets for application in the interpretation of research and monitoring programs, planning processes, and in the development of the next FMP.

2.13 KPI 13 Adaptive response to changing climate

KPI	Performance target	Achievement	C
13	Adaptive responses to be reported at mid-term.	—	H

Status

A wide range of actions have been undertaken during the reporting period to adapt forest management practices, trial mitigation measures and monitor impacts in response to the drying and warming trend experienced in the plan area. Examples across the range of Montreal Criteria for forest sustainability include:

Biological diversity

- Revised guidelines for the selection and design of fauna habitat zones to preference the inclusion of southerly landform aspects, proximity to permanent water bodies and enhanced connectivity with riparian areas.
- Trial translocations of the critically endangered western swamp tortoise were undertaken at locations in the South West and Warren regions where the impacts of a drying climate are likely to be less severe than in the current range of the tortoise in Swan Region.
- Research into vegetation around granite outcrops enabled identification of sites where vegetation structure is likely to be most persistent, potentially providing safe havens for the biota under climate change (Schut *et al.* 2014).
- Research into adaptive capacity to respond to climate change in marri has shown the species is more affected by temperature than rainfall. Genetic analysis suggests adaptation to climate indicating movement of seed from hotter, drier areas is a strategy that can be used to increase adaptive capacity of these areas ahead of changes in climate (Aspinwall *et al.* 2016, Ahrens *et al.* 2018).

Ecosystem health and vitality

- Revised *Phytophthora* dieback interpretation and management guidelines to incorporate processes to check instances of rapid dieback spread following elevated summer rainfall; improved guidance on disease and drought symptoms; and guidance for assessing the risk of disease spread.
- Development of the capacity to predict the severity of jarrah gum leaf skeletoniser outbreaks based on projected seasonal conditions and research on factors predisposing outbreaks of the insect population.
- Revised fire operations guidelines for timing and ignition patterns of prescribed burns reflect changing fuel moisture differentials between vegetation types (e.g. peatlands and surrounding vegetation) arising from prolonged drying conditions and altered seasonal weather patterns.
- Mechanical fuel reduction trials were undertaken in conjunction with the University of the Sunshine Coast, Water Corporation and the FPC to reduce combustible fuels

in areas of high bushfire hazard, also providing a potential commercial opportunity for removal of woody weeds and pine wildings.

- Analysis of lightning ignition trends over last 40 years in the Warren Region indicates an increased fire frequency, informing bushfire threat analysis and the need for prescribed burning programs to adapt to the elevated threat.
- A prototype of a new national fire danger rating system is being validated for Western Australian conditions using data from prescribed fires across a range of forest and fuel types, and weather conditions. This information system integrates vegetation type, fuel loads and downscaled weather data to inform potential fire intensity on a 1.5 km grid resolution. The system will provide a powerful tool to project and deal with the impacts of changing climate on fire behaviour at the local level, particularly within the FMP area.

Soil and water

- Work has commenced to re-thin a catchment thinning trial in jarrah forest at Yarragil, which will extend a 35-year post-thinning hydrological monitoring record to inform management of forest water balance and silviculture.
- Groundwater bores established in the Warren Region in the 1970s were relocated to expand the coverage of sites for monitoring trends in groundwater in a drying climate to inform management of stream salinity and water balance.

Productive capacity

- Revised silviculture guidelines provide for lower stocking and extended regeneration establishment time in eastern jarrah forest and salvage and regeneration of fire-damaged karri and jarrah forests.
- Planting and stand density targets for rehabilitation of mined areas were revised by Alcoa (in collaboration with the Department) to adjust for the drying trend.
- Long-term silvicultural experiments in jarrah and karri forest were measured through a period of climate change to provide information about the growth and vitality of regrowth forests thinned to a range of stand densities.
- FORESTCHECK monitoring has shown that overstorey tree species in low rainfall eastern forest continued to regenerate as seedlings following timber harvesting and fire, despite declining rainfall and higher temperatures.

What contributed to this rating?

- Revision of policy, guidelines and procedures was undertaken by the Department on a periodic basis.
- Ongoing monitoring of the outcomes from field management activities provided direct feedback to the Department on aspects of guidelines and procedures that required revision to accommodate climate-induced change.
- Research is providing information about adaptation strategies for key forest species.

Commission recommendation

The Commission notes the range of actions implemented and acknowledges that for some field actions ongoing monitoring and evaluation of outcomes is necessary to inform future adaptation strategies. In particular, the Commission wants to see greater consideration of data accumulation supporting biodiversity indicators to assist in assessing adaptive management outcomes. Further research and monitoring will be required to adapt to and mitigate the impacts of climate change.

Management Activity 129 of the FMP outlines that the Department will initiate an expert review of silvicultural practices during the second half of the plan. As outlined under the recommendation for KPI 5, modifications to silviculture and fire management documents have been made to enhance biodiversity and other outcomes.

Recommendation 15: That the Department engages and collaborates with research providers to prioritise and integrate research and monitoring programs to inform and improve climate adaptation and mitigation, with the aim of meeting information needs to support the development of the next FMP.

Proposed management response

The continuing evolution of management practices to enhance ecosystem resilience and align with altered productive capacity under a drying climate remains a priority for the Department. Both the Department and the FPC will continue to review guidance documents and incorporate measures to adapt to climate change.

Prioritisation and integration of research and monitoring programs between all groups engaged in adaptation and mitigation research programs is essential to effectively use resources. It is timely for the Department to review and ensure alignment of current work to deliver information needs for development of the next FMP, which is scheduled for 2020-2023.

2.14 KPI 14 Increased knowledge on the amount of carbon stored in forest

KPI	Performance target	Achievement	C
14	Twenty plots established and reported by mid-term and 40 plots by end-of-term.	—	H

Status

No new carbon plots were established during the reporting period.

However, further measurements of above-ground woody biomass (hence carbon) have accrued in forest types for which substantial data was available. This includes the remeasurement of timber inventory and the establishment of nine permanent sample plots in mature karri forest as part of the Ausplots Forest Monitoring Network (Wood *et al.* 2015). Since 2014, over 936 point-plots, 333 transects and 39 detailed utilisation plots were measured in jarrah stands contributing information on biomass, and 50 plots assessed the woody components in regrowth karri stands.

New information on the quantity of woody biomass in heathlands and some other data-poor vegetation associations was recorded in fire research plots, while other fire monitoring and trials recorded measurements of the total fuel in areas subjected to prescribed burning and mechanical fuel reduction (Hollis *et al.* 2018). The remeasurement of FORESTCHECK plots provided data on the distribution and rates of change of woody biomass in jarrah forests, while the ongoing updates to spatial datasets representing harvest, disease occurrence and fire events are necessary inputs for estimation of carbon stocks in the plan area.

What contributed to this rating?

Revised priorities and limited resources contributed to formal plots not being established. However, significant allied work was undertaken across a range of ecosystems and carbon pool components to quantify carbon stock estimations.

Increased collaboration with national and international projects on carbon estimation and bushfire research contributed to capacity to improve overall biomass estimates for some forest types.

Commission recommendation

Based on the range of settings adopted in the FMP (including the forest area, sustained yields and silvicultural practices), it was forecast that on a whole of forest scale, the quantity of carbon stored in live trees in the forests would increase by between three and five per cent during the plan's 10-year period. Reporting on carbon stores informs the contribution of forests to the mitigation of climate change effects.

Recommendation 16: That the Department prioritise reporting on carbon stores over the coming years so that this information will be available for the next draft FMP.

Proposed management response

The Department and the FPC will continue to acquire woody biomass, and hence carbon, data in vegetation associations that currently have limited information on biomass, through planned and targeted measurements, as opportunities arise, to inform revision of carbon stock estimates.

2.15 KPI 15 The area of native forest and plantations

KPI	Performance target	Achievement	C
15	No permanent loss of net area of forested land due to unauthorised activities.	—	H

Status

During the period 2014 to 2017 areas of native forest and plantation continued to be added or excised from CALM Act tenures because of land tenure changes. These arose from road and utility corridor construction, the establishment of basic raw material quarries, and the acquisition of new reserves. The net change in the area on CALM Act tenures within the plan area was an increase of 6,300 hectares for native forests and a decrease of 200 hectares for plantations. The net decrease for plantations does not include 6,300 hectares of fallow land at Gngangara that is no longer available to be planted with pines but remains classified as plantation land. Changes to the availability of forests for wood production also occurred from changes to informal reserves and fauna habitat zones, and this contributed to a net decrease of 300 hectares (Figure 10).

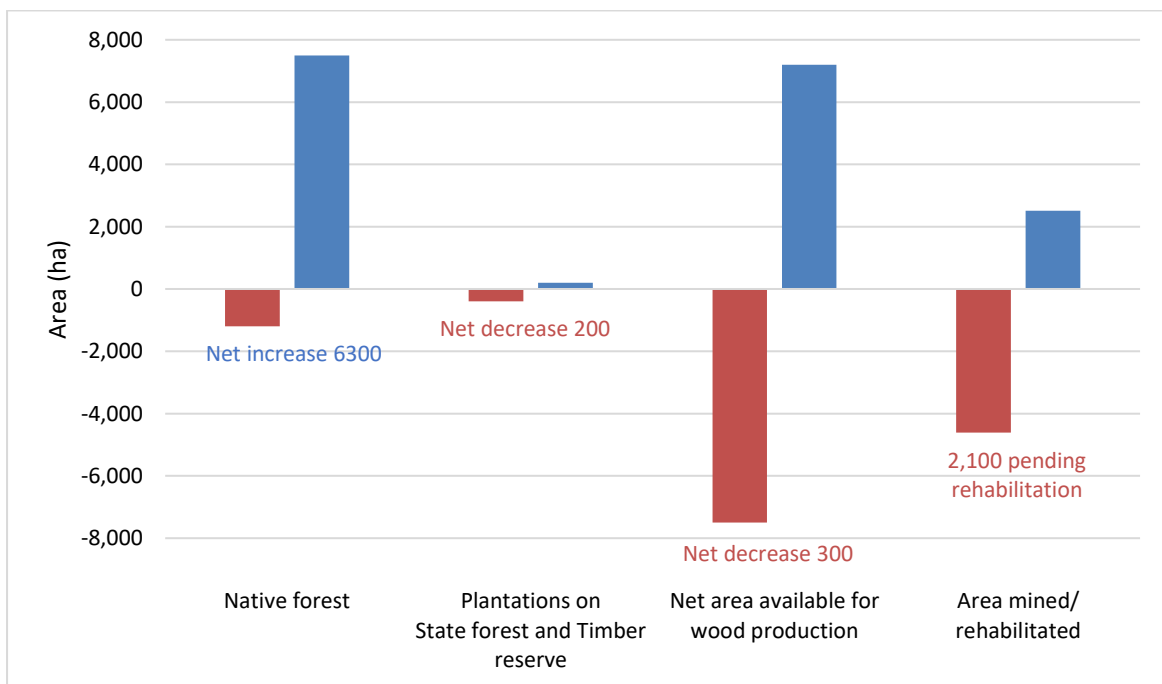


Figure 10: Changes in area of forest, plantation and mined area during 2014-2017 arising from tenure and other changes.

What contributed to this rating?

Native forest

The net increase of 6,300 hectares of native forest arises from a reduction of 1,200 hectares and an addition of 7,500 hectares.

The decrease in native forest area of 1,200 hectares occurred due to the excision of areas of State forest to facilitate the construction of new roads, infrastructure corridors, widening of existing easements and land exchanges. This includes areas excised for the construction of the Perth to Darwin Highway and the Margaret River Bypass Road. Most of this area was classified as non-forest ecosystems (i.e. shrub, herb and sedgeland and banksia woodland).

In contrast, during this reporting period 7,500 hectares was added to the native forest area managed by the Department through the acquisition of lands through offset programs and new reserves proposed in management plans published since commencement of the FMP, such as the *Swan Coastal Plain South Management Plan 2016*. A large proportion of this area comprised jarrah forest, tuart forest or native non-forest ecosystems.

Overall, when the proposed tenure of the parcels of forest is considered, the net change in the area of forest available for wood production was a decrease of 300 hectares.

Plantations

Since 2014 the area of pine plantation on State forest and timber reserves in the plan area has reduced from about 50,500 hectares to 49,900 hectares. This area was offset by an increase of approximately 300 hectares of eucalypt plantation. Significant areas of plantation have been replaced with other land uses including thousands of hectares being left as fallow ground (though still recorded as plantation), basic raw material quarries and roads. Severe bushfires in the Gnangara, Pinjar, McLarty, Myalup and Thomson Brook plantations have also occurred since the beginning of the plan and the FPC is continuing to address the remaining areas to be salvaged and replanted following these fires.

Clearing for mining and mine site rehabilitation

Approximately 4,610 hectares of predominantly jarrah forest was cleared for mining during 2014 to 2017, with 2,510 hectares being rehabilitated following earlier mining operations and 2,100 hectares to be rehabilitated in future years.

Commission commentary

The Commission acknowledges the achievement of this key performance indicator with an overall increase of native forest for biodiversity and only a minor reduction in forest available for harvesting.

Proposed management response

- The Department will continue to seek to minimise and mitigate the reduction in forest area arising from the location of infrastructure on, or alienation of lands vested in the Commission.
- The acquisition of forested lands to add to Department managed lands will continue, with a focus on maintaining the net area available for wood production and ensuring

less-well represented vegetation types and forest ecosystems are added to the reserve system.

- The FPC will work with the Department and other agencies to secure additional plantation areas consistent with the *Softwood Industry Strategy for Western Australia* (FPC 2016), and to address the future management of fallow areas on Gnangara mound.
- The Department will continue to monitor the rate of rehabilitation of areas cleared for mining.

2.16 KPI 16 Removal of log products compared to the allowable cut

KPI	Performance target	Achievement	C
16.1	The cumulative removals of first and second grade jarrah and karri sawlogs shall not exceed the cumulative average annual allowable cut by more than 10 and five per cent at the end of years 3 and 6 respectively, and three per cent at the end of year 9 of the plan, and the total removals over the 10-year plan period shall not exceed the allowable cut.	—	H
16.2	No more than the allowable cut of other bole volume of jarrah and karri, and total bole volume of marri logs over the 10-year plan period.	Not yet due	
16.3	No more than the allowable cut of wandoo, blackbutt and sheoak sawlogs to be removed over the 10-year plan period.	Not yet due	

Status

The volume of sawlogs removed during timber harvesting was significantly less than the FMP average annual allowable cut (lower limits) for jarrah and karri. The jarrah and karri other bole volume removals were also substantially less than the pro-rata level at the end of the fourth year of the 10-year plan period, as were the minor species sawlog removals (Table 8).

Table 8: Cumulative removal of wood products during 2014 to 2017 by product.

Product	Removed ⁷ (m ³)	Cumulative average annual limit ⁸ (m ³)	% of limit
Jarrah first and second grade sawlog	403,777	528,000	76
Karri first and second grade sawlog	175,007	236,000	74
Jarrah other bole volume	629,669	1,168,000	54
Karri other bole volume	448,116	656,000	68
Marri bole volume	55,618	560,000	10
Blackbutt first and second grade sawlog	2,813	5,200	54
Wandoo first and second grade sawlog	249	4,400	6
Sheoak first and second grade sawlog	512	4,800	11

⁷ Note that the information reported here will differ slightly to those in agency annual reports because of adjustments to raw data to reflect log products accepted by customers and off-cuts retained in the forest.

⁸ This KPI specifies cumulative targets for the jarrah and karri sawlog removals that are not to be exceeded at years 3, 6 and 9. Figures presented here for all species and products are the pro-rata value over the 10-year period for the lower limits of the allowable cut.

What contributed to this rating?

- The outcome for first and second grade sawlogs was the result of variations in market demand, structural adjustments within the sawmilling sector, and the FPC setting contracted amounts lower than the FMP limits due to the economic viability of accessing lower yielding coupes.
- The low levels of jarrah and marri other bole volume and minor species removed was due to the difficulties in the FPC accessing markets for this material, though during the period there was an increase over time in the removal of jarrah other bole volume due to new markets and log processing opportunities.

Commission recommendation

Recommendation 17: That the FPC prioritise the implementation of FMP management activities supporting the utilisation of allowable other bole volumes in jarrah forest to meet the forest health and productive capacity objectives of the FMP.

Proposed management response

- The FPC, in consultation with the Department, will continue to monitor log removals to ensure the limits for the 10-year period of the plan are not exceeded.
- The low level of removal of marri and jarrah other bole volume has significant flow-on effects to the achievement of silvicultural objectives (see KPI 17), future forest condition arising from harvest operations, capacity to access lower yielding areas, profitability of the forest products industry, and all other factors being equal will reduce future sustained yield.
- The FPC will continue to seek to better utilise the available material through expanding access to markets for other bole volume, the application of new technologies and processes to reduce production costs and undertake trials of suitability for various engineered wood products.

2.17 KPI 17 Silvicultural outcomes for the area cutover

KPI	Performance target	Achievement	C
17.1a	Compliance level of 95 per cent against the prescribed requirements assessed by silvicultural outcome (in karri).	—	H
17.1b	Compliance level of 95 per cent against the prescribed requirements assessed by silvicultural outcome (in jarrah).	—	H
17.2	Compliance level of 95 per cent against the prescribed requirements assessed by monitoring surveys (in jarrah).	—	H

Status

Depending on the structure, condition, disease and regeneration status, forest areas are harvested to a range of silvicultural objectives. These include thinning to promote growth on retained trees; release of a regeneration cohort already present; or the establishment of new regeneration. However, the silvicultural outcome achieved will depend on the practices employed prior to timber harvesting (e.g. tree marking), during harvest (e.g. removing available trees without damaging those to be retained) and after harvest (e.g. silvicultural burning to achieve regeneration, or non-commercial culling of unwanted trees).

Silvicultural outcomes were achieved in karri forest and partially achieved in jarrah forest.

Silvicultural outcome for karri

During 2012 – 2016, silvicultural outcomes across the 4,700 hectares of karri forest harvested achieved the objectives in all areas, resulting in the following outcomes:

- 2,960 hectares (63 per cent) of thinning;
- 1,460 hectares (31 per cent) of regeneration establishment; and
- 280 hectares (6 per cent) where operations are not yet complete, but likely to meet the objective.

Silvicultural outcome for jarrah

During 2012 – 2016, silvicultural outcomes consistent with the silvicultural objectives were not achieved across at least 45 per cent of the 29,740 hectares of jarrah forest harvested. The silvicultural outcomes across the 29,740 hectares were:

- 1,300 hectares (4 per cent) of thinning to focus growth onto retained trees;
- 1,400 hectares (5 per cent) of gap creation to release established regeneration;
- 3,280 hectares (11 per cent) of shelterwood for regeneration establishment;
- 400 hectares (1 per cent) of harvest of diseased forest, to mitigate *Phytophthora* dieback impacts;
- 13,360 hectares (45 per cent) of selective harvest where insufficient trees were removed to meet the prescribed standard; and

- 10,000 hectares (34 per cent) of interim selective harvest where operations are not yet complete, but unlikely to receive treatment to achieve objective.

Jarrah monitoring surveys

Monitoring of the range of activities pre, during, and post-harvest that contribute to the final silvicultural outcomes for jarrah confirmed the high proportion of selective outcomes due to the excessive retention of unwanted trees. For jarrah forest, 42 per cent of the surveys fully achieved the desired outcome (Table 9).

Table 9: Results of silvicultural monitoring surveys undertaken during 2014 to 2017

	Pre-harvest	During harvest	Post-harvest
overall findings	81% of surveys achieved target	70% of surveys achieved target	42% of surveys achieved target

What contributed to this rating?

- For karri forest, the achievement of silvicultural objectives is a consequence of there being markets for small diameter sawlogs and other bole volume which allows target stand densities to be achieved through commercial timber harvesting operations.
- For jarrah forest, the main reason for not achieving silvicultural outcomes was the excessive retention of unmarked trees, which in turn was due to insufficient access to markets for jarrah and marri other bole volume.

Commission commentary

The Commission notes the achievement of silvicultural objectives for karri forest. In terms of jarrah forest, the Commission has concerns around the implications of not fully achieving the silviculture objectives in harvested coupes with implications on productive capacity.

The Commission supports the silvicultural objectives outlined in the FMP with preference for timely thinning of regenerating native forest and integration of thinning with current operations.

Proposed management response

- The FPC will continue to apply process and audit controls to ensure that guidelines are applied in field operations.
- The high proportion of selective outcomes in jarrah forest will, all other factors being equal, reduce the future sawlog sustained yield. The Department will take this into account when projecting future sustained yields.

- The FPC will continue to seek to better utilise the available material through securing access to markets for other bole volume, such as the existing energy market, the application of new technologies and processes to reduce production costs and undertake trials of suitability for various engineered wood products.

2.18 KPI 18 Regeneration of harvested area

KPI	Performance target	Achievement	C
18.1a	For karri and planted jarrah, achieve more than 75 per cent of areas treated to be completed within 18 months.	—	H
18.1b	For karri and planted jarrah, achieve 100 per cent of areas treated to be completed within 30 months.	—	H
18.1c	For jarrah which has not been planted, achieve 90 per cent of areas treated to be completed within 30 months except in accepted circumstances.	—	H
18.2	No more than five per cent of the area regenerated requiring remedial action – jarrah operations.	—	H
18.3	No more than five per cent of the area replanted requiring remedial action – clear-felled plantation.	—	H

Status

More than 75 per cent of areas treated were completed within 18 months. However, for regeneration treatment of jarrah which has not been planted, more than half of the areas were not treated within the 30-month target.

What contributed to this rating?

Delays in completing the Department's scheduled silvicultural burning program remained the major factor contributing to not achieving the 30-month target for jarrah post-harvest regeneration treatment. The introduction of the Enhanced Prescribed Burning Program in 2015-16 has enabled more silvicultural burns to be completed and a substantial reduction in the backlog of areas requiring regeneration.

Commission commentary

The Commission noted the substantial progress towards achieving the performance target for the regeneration of harvested areas.

Proposed management response

- Further refinements to the scheduling and prioritisation of silvicultural burning within jarrah forest will be undertaken by the Department and the FPC.
- Delays in establishing regeneration will be factored into subsequent modelling of productive capacity and sustained yields for jarrah.

2.19 KPI 19 Plantations are managed to meet obligations under State Agreements and production contracts

KPI	Performance target	Achievement	C
19	The total annual volume of each log grade delivered compared to supply obligations (arising from State Agreement Act and other contracts applicable during the plan period). ⁹	—	H

⁹ As assessed by the FPC

Status

- Actual supply was close to budgeted demand throughout the reporting period (Figure 11).

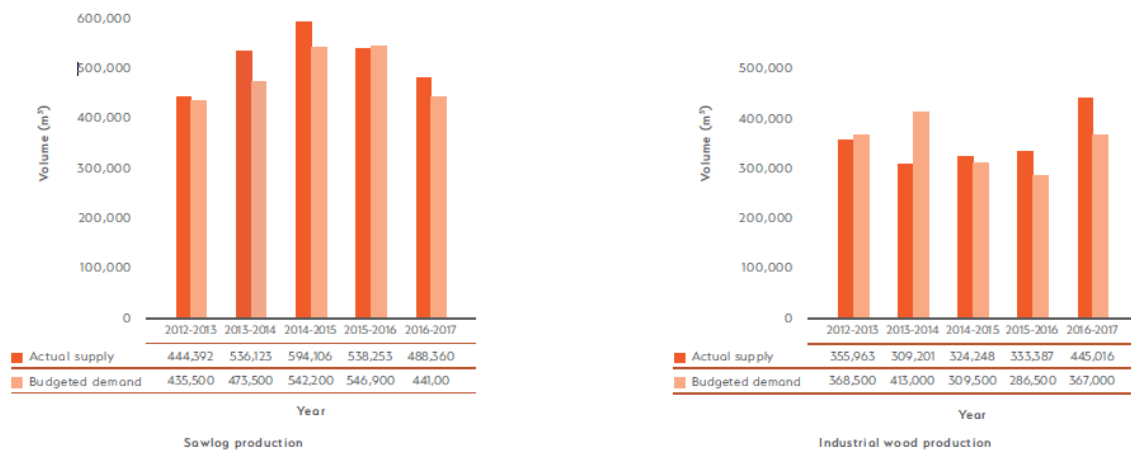


Figure 11: Softwood plantation log production as compared to budgeted demand from industry (contracts of sale are varied by agreement between the FPC and suppliers during the year and recorded in its annual reporting as 'budgeted demand').

What contributed to this rating?

Contracts of sale typically include a maximum amount that the FPC is required to supply. However, the contracts also include provisions for customers to request a lesser amount in any year depending on market demand and alternative sources of supply. As a result, budgeted demand has fluctuated over the period.

The FPC and its customers work together to manage short-term changes in supply or demand that may arise due to plant breakdowns, market cycles or the need to respond to events such as fires that may require salvage programs. Short term opportunities also arise to meet plantation management objectives by supplying export markets when prices are favourable.

In 2015, the Department of Treasury approved the FPC to reinvest \$21 million from retained earnings into new plantations over five years. These plantations are now being established on a mix of State government and private land. The FPC is working with private industry to ensure this investment is leveraged and the industry achieves sufficient scale to be efficient and competitive.

Commission commentary

The Commission notes the achievement of the performance target for managed plantations.

Proposed management response

The area of plantation resource to support the industry is predicted to decline. The FPC and industry are working to minimise the impacts of these forecast shortfalls through continuing to support increased plantation establishment in line with the *Softwood Industry Strategy for Western Australia* (2016).

2.20 KPI 20 Consultation and involvement of Noongar people

KPI	Performance target	Achievement	C
20.1	Establishment of at least six joint management arrangements under the CALM Act by 2023.	Not yet due	
20.2	Local area arrangement and protocols for Aboriginal customary activities established and implemented within each district of the Department in the plan area by 2023.	Not yet due	
20.3	Appropriate and representative Noongar groups to be consulted and invited to provide input into all management plans.		H

Status

1. Establishment of at least six joint management arrangements under the CALM Act by 2023.

The South West Native Title (SWNT) Settlement was signed in June 2015 and includes the commitment to establish Co-operative Management Committees over all CALM Act land within each of the six Noongar Regional Corporation areas. These Co-operative Management Committees provide a forum for the Noongar community to provide advice over the management of CALM Act land within each area. The Co-operative Management Committees will also identify six priority parks or reserves for formal joint management within the first five years, and a further six parks or reserves in the next five years.

The terms of the Co-operative Management Agreements and Joint Management Agreements have been negotiated and form part of the SWNT Settlement agreement.

The SWNT Settlement has been delayed by legal matters and is not expected to be implemented until early 2019.

Once the SWNT Settlement commences, a formal structure will be established to work with Noongar people through the Co-operative Management Committees to identify and establish joint management agreements for priority parks and reserves, and to provide advice and input into the identification of Aboriginal cultural values and input into management plans.

2. Local area arrangements and protocols for Aboriginal customary activities established and implemented within each district of the Department in the plan area by 2023.

There are a small number of Local Area Arrangements developed within the plan area, which facilitate the conduct of Aboriginal customary activities. Other types of protocols on engaging with Aboriginal people on customary activities and broader engagement strategies have also been developed.

3. Appropriate and representative Noongar groups are consulted and invited to provide input into all management plans.

Consultation with appropriate and representative Noongar groups is routinely undertaken, both formally and informally, through the development of CALM Act management plans. Consultation has occurred for the *Swan Coastal Plain South*

Management Plan 2016, Vasse-Wonnerup Operational Plan and proposed expansion of the Wellington National Park.

What contributed to this outcome?

The Department played a key role in the whole-of-Government negotiations for the SWNT Settlement and developed and negotiated the inclusion of provisions to provide for the co-management of conservation estate within the settlement.

The Department has prepared a comprehensive corporate policy and guideline relating to joint management with Aboriginal people. This policy and guideline will assist with implementation of the joint management arrangements under the SWNT Settlement when the ILUAs are registered and all outstanding legal matters are resolved.

Commission commentary

The Commission acknowledges the key performance indicator related to the management of Noongar culture and heritage has been achieved as it relates to the involvement and consultation of appropriate and representative Noongar groups in the development of management plans.

Proposed management response

The Department will continue to work with Noongar people in the management of the plan area by:

- fulfilling its responsibilities under the SWNT Settlement;
- implementing its policies and corporate guidelines relating to joint management with Aboriginal people and customary activities; and
- consulting with appropriate and representative Noongar groups in the development of management plans, including the proposed expansion of Wellington National Park.

Given the framework for joint management is set out within the SWNT Settlement, it is not possible to commence joint management arrangements prior to the implementation of the SWNT Settlement. The SWNT Settlement will establish a structure to facilitate and incorporate ongoing Noongar involvement and advice in the management of conservation in the plan area.

2.21 KPI 21 Social and economic benefits from the timber industry

KPI	Performance target	Achievement	C
21.1a	All high value sawlog resource processed or value added locally. ¹⁰	—	H
21.1b	An increase in low value resource taken on by local markets. ¹⁰	—	H
21.2	Increased local processing capacity. ⁷	—	M
21.3	Employment and social benefits maintained or increased. ¹⁰	—	L

¹⁰ As assessed by the FPC

Status

- All first and second grade sawlogs were processed locally. Contracts of sale required customers purchasing sawlog quality material to commit to domestic processing. However, it is difficult to track the volumes that undergo local value-adding as companies consider this information to be commercial in confidence and this data has been difficult to obtain. There has been an increase in other bole volume taken on by local markets.
- A detailed study of the socio-economic impacts of the forestry industry (Schirmer *et al.* 2017) found that in 2015-16, the direct value of output generated by the WA forestry industry at the point of sale of primary processed products was \$649 million, increasing to \$1,405 million when flow-on effects generated in other industries is included. The study covered the South West, Wheatbelt, Great Southern and Esperance regions and does not specifically address the FMP region, though the native forests and the much of the softwood plantations are located within the FMP area.
- The study referred to above showed that the industry generated 2,114 direct jobs up to the point of primary processing; the estimated flow-on employment generated was an additional 2,456 jobs. Secondary processing of timber provided a further 1,495 jobs meaning that the industry as a whole supports the employment of around 6,000 people, showing the importance of local processing facilities to generating regional economic activity from the industry.
- The survey of industry processors identified the need for new investment, and ideally, on inter-dependent processing facilities that use all parts of the logs.
- The study found that positive perception of the forest industry in the community can be improved. While those living in communities where the industry operates view these communities just as, or slightly more, liveable than those living in communities with little industry activity, they do not generally view the forest industry as making substantial contributions beyond employment.

What contributed to this rating?

State-wide policy supports the local forestry industry through its buy local policies, the *Softwood Industry Strategy for Western Australia* (FPC 2016) and conditions of the contracts of sale of forest products.

There was some significant local industry investment in improving efficiency and new technologies, including the 2016 consolidation of Auswest's sawmills at the Greenbushes site. Auswest invested in the Greenbushes site to recommission the small log line, building a new large log line and installing a multi-sensor quality scanner to improve recovery rates, processing speed and value. This technology, while commonplace in the softwood industry, is reported to be the first of its kind to be used in native forest timber mills in Australia.

Harvesting contractors continued to invest by updating harvesting and transport equipment to ensure efficiency and state of the art optimising technology is utilised. With each piece of equipment estimated to cost on average \$5-600,000 the industry annually spends ~\$3-4 million on equipment purchases and maintenance.

The positive figures regarding the employment and social benefits from the forest industry are a combined result of industry confidence and investment in new processing technologies and consolidation of operations to improve operational efficiencies.

Commission commentary

The Commission acknowledges the KPI related to the social and economic benefits from the timber industry has been achieved and notes that there are further opportunities for increased local processing capacity.

Proposed management response

The FPC continues to work proactively with industry and the community facilitating a vibrant industry that makes a positive contribution to regional communities by:

- adopting policy settings that support increased value-adding and local processing of high value timber and other bole volume;
- building on the strength of the industry as a manufacturer of locally grown timber;
- improving engagement with the community to promote greater understanding of the benefits brought by the industry to local communities; and
- ensuring that monitoring of the socio-economic impacts of the forest industry is continued.

2.22 KPI 22 Visitation, facilities and visitor satisfaction

KPI	Performance target	Achievement	C
22.1	Level of visitation to be maintained or increased.	↗	H
22.2	No target, trends to be reported (recreation and tourism facilities).	No target	↗
22.3	Visitor satisfaction to meet or exceed Departmental benchmark.	—	H

Status

Number of visits to selected recreation areas and the satisfaction visitors express with their experience

Reportable visitation has increased by 25 per cent across the reporting period, from 9.7 million in 2013-14 to 12.2 million in 2016-17, achieving the performance target of the level of visitation to be maintained or increased. Visitor satisfaction has consistently remained above the Departmental benchmark (85 per cent) for the duration of the reporting period, rising from 90 per cent in 2013-14 to 93 per cent in 2016-17, achieving the performance target to meet or exceed the Departmental benchmark.

Type and number of recreation and tourism facilities available in the plan area

Since 2013, the numbers of recreation and tourism facilities reported in all asset types increased.

What contributed to this rating?

Number of visits to selected recreation areas and the satisfaction visitors express with their experience

Approximately 1.8 million of the 2.5 million increase in visits across the period was due to improvements in monitoring at Leeuwin-Naturaliste National Park, Rockingham Lakes Regional Park and Woodman Point Regional Park between 2013 and 2015. The remainder of the change appears to be due to increased visitation at monitored recreation sites.

There were a number of new and upgraded recreation sites and campgrounds across the area leading to increased visitation.

Type and number of recreation and tourism facilities available in the plan area

The increase in asset numbers across all asset types was due in part to the refurbishment and construction of new campgrounds.

Commission commentary

The Commission acknowledges the key performance indicator for visitation, facilities and visitor satisfaction has been achieved and notes the increase of visitation while maintaining high levels of visitor satisfaction with their experience.

Proposed management response

The Department will continue to conduct activities to enhance visitation and visitor satisfaction and record the type and number of recreation and tourism facilities available in the plan area.

2.23 KPI 23 Maintaining an effective strategic road network

KPI	Performance target	Achievement	C
23	Access via strategic road network to be maintained.	↘	H

Status

- The strategic road network continues to be maintained and remain open. Although some roads have been reclassified by type and category, the essential network is being maintained in a state that allows it to be used.
- A dedicated strategic bridge replacement and maintenance program has been implemented, with at least one third of available funding being allocated by the Department to keep bridges open. Maintenance and replacement of bridges within the strategic road network is a priority and the percentage of bridges that are closed or have limits to the vehicles that can use them has decreased since this program commenced in 2013-14. While the number of closed load posted bridges continued to reduce in each financial year to 2017 achieving the aim of two per cent each year, 14 per cent of bridges are closed or have load limits.
- While access via the strategic road network has generally been maintained, without continued investment roads will become rougher and more hazardous over time and travel times will become longer (e.g. increased lead time in response to bushfire). As such, the target is considered to have been partially achieved.

What contributed to this rating?

A strategic approach to classification, condition scoring and maintenance of the road network has enabled available funding to be directed to the highest priority roads and bridges in the network. However, funding is insufficient to renew roads or fully maintain the strategic road network.

Commission recommendation

The Commission notes that the prioritisation of funding towards maintaining roads and bridges in the network has allowed for the continued use of the essential network. The Commission is concerned about the implications of lack of funding for road and bridge maintenance into the future.

Recommendation 18: That additional funding be sought and allocated towards maintaining the strategic road and bridge network to improve public safety and to improve access for bushfire suppression.

Proposed management response

- Consistent with the roads policy, the Department will continue to implement a strategic approach to the classification, condition scoring and maintenance of the

road network directing available funding to the highest priority roads and bridges in the FMP area.

2.24 KPI 24 Extent to which the institutional framework supports the conservation and sustainable management of forests

KPI	Performance target	Achievement	C
24.1	Guidance documents to be prepared and/or reviewed as required during the period of the plan.	—	H
24.2 a	Research projects address identified high priority knowledge gaps.	—	H
24.2 b	Peer reviewed articles are produced by research projects.	—	H
24.2 c	Knowledge gained is communicated to policy makers and operational managers.	—	H
24.3 a	Public attendance for key education awareness and extension programs to be maintained.	—	H
24.3 b	Volunteer contribution (number of volunteers and volunteer hours) to be maintained.	—	H

Status

Guidance documents

Over the reporting period, 12 procedures, three guidelines, four field guides, four manuals and two technical reports were prepared or reviewed. All outstanding guidance documents were finalised by May 2018.

Scientific understanding

Research addressed knowledge gaps relating to fire, the effect of drying climate on streams, wetlands and groundwater, effective control of feral predators, and genetic variation within understorey species used for rehabilitation of disturbed sites. The FORESTCHECK monitoring program was expanded with additional sites in the Jarrah South and Jarrah Sandy Basins ecosystems.

Public education and volunteer contributions

There was a continuation of the ongoing increase in volunteer numbers and volunteer hours that has been observed since commencement of the previous FMP in 2004 as shown in Figure 12.

Volunteers engaged in a range of projects including weed and feral animal control, scientific study, data analysis and monitoring of flora and fauna, establishment and maintenance of tracks and trails and campground hosting.

Public attendance through the Department's Nearer to Nature environmental education program has maintained a steady participation rate at around 23,000 participants annually.

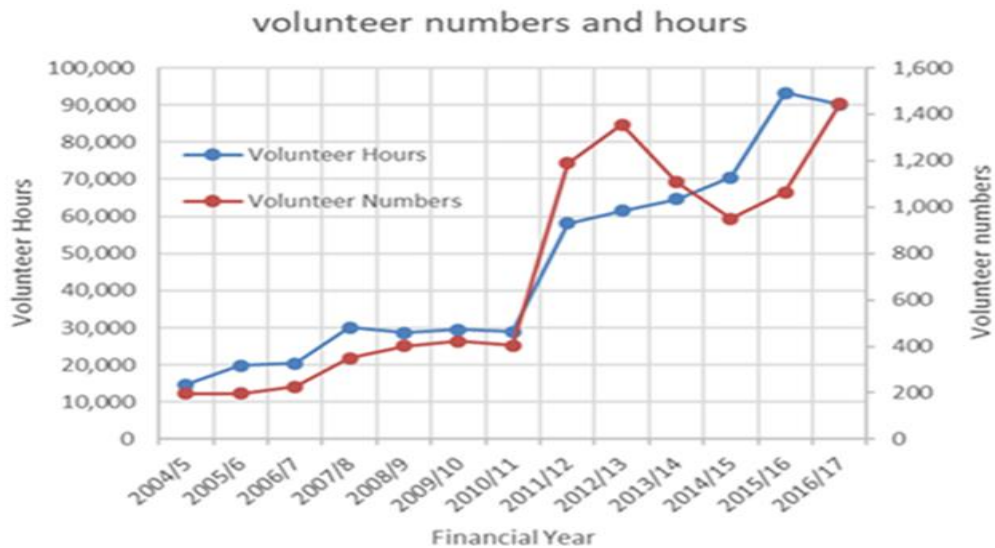


Figure 12: Volunteer numbers and hours.

What contributed to this rating?

Priority was given to the preparation and review of guidance documents where it was necessary to reflect the circumstances of the FMP for operational activities.

Fifty-four peer reviewed scientific articles relevant to ecologically sustainable forest management were authored or co-authored by Departmental staff in the period July 2014 to December 2017. Publication output focused on biological diversity and ecosystem health and vitality, with a small output of papers relating to climate change and carbon cycles and a single paper on productive capacity. Output of scientific publications has continued at a similar rate to the latter period of the previous FMP, despite reduced investment in research.

Knowledge gained from research is communicated through a range of mechanisms including science information notes, management guidelines, formal presentations, participation in threatened species recovery teams and planning teams, and through decision support tools. For example, in collaboration with CSIRO, fire behavior prediction systems have been made available to operational staff. Collaboration with key partners including CSIRO, BOM and universities has been a key factor contributing to the department's ability to improve scientific understanding.

The sustained or increased involvement in volunteer contribution and eco-education participation is attributed to the continuing efforts to support and encourage public involvement in conservation management. The increase in volunteer contribution around 2011-12 – 2013-14 was likely due to improvements in the supporting database and associated administrative processes together with a number of volunteer projects starting up or increasing during that time.

Commission commentary

The Commission acknowledges the achievements of the KPI related to the extent to which the institutional framework supports the conservation and sustainable management of forests.

Proposed management response

The Department will continue to:

- prepare and review guidance documents on a priority basis;
- seek opportunities and resources to address identified high priority research topics including those identified through the KPI findings from the mid-term review process and those identified in the processes leading to the approval of the FMP; and
- support existing programs for volunteering and environmental education to continue to build communication links and understanding between the Department and the community.

3 Management Activities

The status of implementation for each of the 134 management activities in the FMP is listed in Appendix 1. Collectively, the suite of activities confirm that substantial progress continues to be made toward the Commission's overall goal in formulating the FMP. These include:

- conserving biodiversity;
- sustaining the health, vitality and productive capacity of ecosystems;
- protecting soil and water resources;
- sustaining the contribution of global carbon cycles; and
- for the social, cultural and economic benefits valued by the community to be produced in a manner taking account of the principles of ESFM.

4 In summary

The performance review considered the status of 49 measures to indicate the achievement or otherwise of performance targets for 24 KPIs.

About 80 per cent of performance targets were achieved or largely met, with 16 per cent of performance measures or success criteria only met in some cases, and four per cent of performance targets not achieved or not progressed (see Figure 13). The Commission acknowledges the management agencies for achieving this result given the challenging economic and climatic conditions over the last five years.

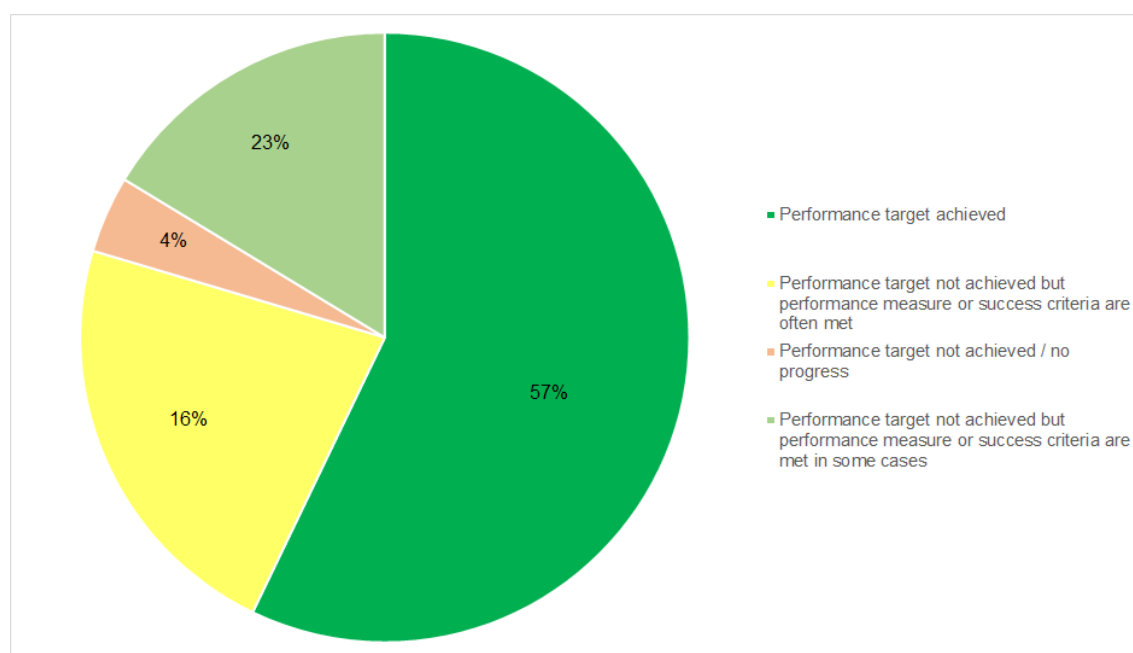


Figure 13. Overall level of achievement of the KPI targets

The assessment of the achievement of performance targets for KPIs related to biological diversity and ecosystem health and vitality required information to be available from the Department through relevant regional nature conservation plans or regional fire plans. This information was not readily available at the time of the performance review and therefore required the use of relevant and appropriate surrogate measures. Although these surrogate measures did in many instances provide some indication of the status of the performance indicator, it made it difficult to draw conclusions with confidence.

With this in mind the Commission is seeking to ensure continuous improvement in management to achieve the objectives of the FMP and to that end the recommendations provided in relation to specific KPI ratings should ensure the effective implementation of the current FMP while continuing to build a rigorous knowledge base for the development of the next FMP in 2023.

Recommendation 19: That the Department and the FPC present a progress report to the Commission for KPIs where the performance review target was not achieved or only achieved some of the time, as well as addressing the recommendations of this report, annually by 30 September effective from 2019.

References

- Aspinwall M.J., Vårhammar A., Blackman C.J., Tjoelker M.G., Ahrens C., Byrne M., David T., Tissue D.T. and Rymer, P.D. (2016) Adaptation and acclimation both influence photosynthetic and respiratory temperature responses in *Corymbia calophylla*. *Tree Physiology* 37: 1095-1112.
- Ahrens, C., Byrne, M. and Rymer, P. (2018) Standing genetic variation within coding and regulatory regions contributes to the adaptive capacity to climate change in a foundation tree species. *Molecular Ecology* in review.
- Brouwers, N.C., Matusick, G., Ruthrof, K., Lyons, T. and Hardy, G. (2013) Landscape-scale assessment of tree crown dieback following extreme drought and heat in a Mediterranean eucalypt forest ecosystem. *Landscape Ecology* 28: 69-80.
- Christensen, P. (1992) *The karri forest*. Department of Conservation and Land Management, Perth.
- Conservation Commission of Western Australia (2012). Forest Management Plan 2004–2013 End-of-term audit of performance report. Conservation Commission of Western Australia, Perth.
- Croton, J.T., Dalton, J.A., Dalton, G.T. Green, K.A., and Mauger, G.W. (2015) South-west forest water-balance study to inform the review of silviculture guidelines. Forest Management Series, Technical Report No. FEM062. Department of Parks and Wildlife, Western Australia.
- CSIRO (2007) Climate Change in Australia – Technical Report 2007. CSIRO and Bureau of Meteorology, Melbourne, Victoria, Australia.
- Dowdy, A.J. and Pepler, A. (2018). Pyroconvection risk in Australia: climatological changes in atmospheric stability and surface fire weather conditions. *Geophysical Research Letters* 45: 2005-2013. doi: 10.1002/2017gl076654.
- FPC (2016). Softwood Industry Strategy for Western Australia: Six steps for a vibrant, clean and green industry in regional WA. Forest Products Commission, Western Australia.
- Hollis, J., McCaw, L. and Cruz M. (2018). The effect of woody fuel characteristics on fuel consumption: a case study from a eucalypt forest in south-west Western Australia. *International Journal of Wildland Fire* 27: 363-375.
- Kinal, J. and Stoneman, G.L. (2012) Disconnection of groundwater from surface water causes a fundamental change in hydrology in a forested catchment in south-western Australia. *Journal of Hydrology* 472-473: 14-24.
- Mattiske, E.M., and Havel, J.J. (2002). Delineation of landscape conservation units in southwest region of Western Australia. Mattiske Consulting Pty Ltd and Havel Land Consultants. Report for the Department of Conservation and Land Management, Western Australia.
- McCarthy, M.A., Gill, A.M. and Bradstock, R.A. (2001). Theoretical fire-interval distributions. *International Journal of Wildland Fire* 10: 73-77.

Matusick, G., Ruthrof, K.X., Brouwers, N.C., Dell, B. and St.J. Hardy, G. (2012). Sudden forest canopy collapse corresponding with extreme drought and heat in a mediterranean-type eucalypt forest in southwestern Australia. *European Journal of Forest Research* 132: 497-510.

Office of the Auditor General Western Australia (2017) Rich and Rare: Conservation of Threatened Species Follow-up Audit. Western Australian Auditor General's Report, Report 16, September 2017. Office of the Auditor General Western Australia.

Paul, K., Roxburgh, S. H., Chave, J., England, J. R., Zerihun, A., Specht, A., Lewis, T. E., Bennett, L. J., Baker, T. G., Adams, M., Huxtable, D., Montagu, K. D., Falster, D. S., Feller, M., Sochacki, S. J., Ritson, P., Bastin, G., Bartle, J. R., Wildo, D., Hobbs, T., Larmour, J., Waterworth, R. M., Stewart, H., Jonston, J., Forrester, D.I., Applegate, G., Mendham, D., Bradford, M. G., O'Grady, A. P., Green, D., Sudmeyer, R., Rance, S. J., Turner, J., Barton, C., Wenk, E. H., Grove, T., Attiwill, P. M., Pinkard, E., Butler, D., Brooksbank, K., Spencer, B., Snowdon, P., O'Brien, N., Battaglia, M., Cameron, D. M., Hamilton, S., McAuthor, G., Sinclair, J., Williams, D., Bradstock, R., Bennett, R., Peck, A., Theiveyanathan, S., Murphy, S., Carter, J. (2016). Testing the generality of total above-ground biomass allometry across plant functional types at the continent scale. *Global Change Biology*. doi: 10.1111/gcb.13201

Peace, M., McCaw, L., Santos, B., Kepert, J.D., Burrows, N. and Fawcett, R.J.B.T. (2017). Meteorological drivers of extreme fire behaviour during the Waroona bushfire, Western Australia, January 2016. *Journal of Southern Hemisphere Earth Systems Science* 67:2, 79-106.

Penniford, M.G., Williams, K.J., Pinder, A.M., Harwood, T.D., Manion, G., and Ferrier, S. (2017) Whole-landscape modelling of compositional turnover in aquatic invertebrates informs conservation gap analysis: An example from south-western Australia. *Freshwater Biology* 62: 1359-1376.

Schirmer, J., Mylek, M., Magnusson, A., Yabsley, B. and Morison, J. (2017) Socio-economic impacts of the forest industry Western Australia December 2017. Forest and Wood Products Australia.

Schut, A.G.T., Wardell-Johnson, G.W., Yates, C.J., Keppel, G., Baran, I., Franklin, S.E., Hopper, S.D., Van Niel, K.P., Mucina, L., and Byrne, M. (2014). Rapid characterisation of vegetation structure to predict refugia and climate change impacts across a global biodiversity hotspot. *PLoS ONE* 9(1): e82778. doi:10.1371/journal.pone.0082778

Wayne, A., Ward, C., Rooney, J. and Wheeler, I. (2000) The immediate impacts of timber harvesting and associated activities on the Ngwajir *Pseudocheirus occidentalis* in the Jarrah forest of Kingstons State Forest Block. Progress Report December 2000. Unpublished Report prepared for the Western Australian Department of Conservation and Land Management.

Wayne, A.F., Cowling, A., Lindenmayer, D.B., Ward, C.G., Vellios, C.V., Donnelly, C.F. and Calver, M.C. (2006) The abundance of a threatened arboreal marsupial in relation to anthropogenic disturbances at local and landscape scales in

Mediterranean-type forests in south-western Australia. *Biological Conservation* 127: 463-476.

Wayne, A.F., Wilson, B.A. and Woinarski, J.C.Z. (2017) Falling apart? Insights and lessons from three recent studies documenting rapid and severe decline in terrestrial mammal assemblages of northern, south-eastern and south-western Australia. *Wildlife Research* 44: 114-126.

Wood, S.W., Prior, L.D., Stephens, H.C. and Bowman, D.M.J.S. (2015) Macroecology of Australian tall eucalypt forests: Baseline data from a continental-scale permanent plot network. *PLoS ONE* 10(9): e0137811. doi:10.1371/journal.pone.0137811

Appendices

Appendix 1 Management activities report card

Legend

Reporting metric	Rating and symbol	
Achievement / progress (compared to previous period)	Not achieved / no progress	■
	Partly achieved / in progress	■
	Substantially achieved / substantial progress	■
	Achieved / complete	■
	Marker if achieved or substantially achieved	•
Direction of progress if not achieved / no progress or partly achieved / in progress	Improved	↗
	Steady	—
	Decreased	↘
Confidence in rating (C)	Low	L
	Medium	M
	High	H

The report card below is interpreted in the context of the purpose of a CALM Act management plan which is to enable certain management activities to be undertaken should there be a need to do so, noting that there will not necessarily be a need for all management activities to be undertaken during the period of reporting here or indeed the whole period of the plan. Interpretation of implementation has also been undertaken in the context of the intent of the management activity, and an individual breach does not over-ride the overall achievement of a particular management activity. To properly interpret the requirements of the management activity the full text in the FMP should be referred to. For brevity the full text of each management activity is not repeated below, and it needs to be noted that many management activities are qualified to the extent that certain activities will seek to be done, or they will be done where reasonable and practicable. Activities for which the FPC has responsibility have been assessed by the FPC.

Report card

No.	Management Activity (abbreviated)	Achievement	C
1	initiate and/or progress processes for land category changes	•	H
2	management consistent with proposed land category - NP, NR, CP	•	H
3	establishment of CAR reserve system outside RFA area	•	H
4	management consistent with proposed land category - FCA	•	H
5	conduct operations within informal reserves according to guidelines	•	M
6.1	publish a map each year showing old-growth forest and any changes	•	H
6.2	uniformity of approach for assessment of old-growth forest status	•	H
6.3	develop a procedure to identify and demarcate old-growth forest	•	H
7	commission maintain nominations and assessment until 6.3 completed	•	H
8.1	minimise permanent loss of native vegetation from development	•	M
8.2	offset losses arising from development in line with policy	•	M
8.3	infrastructure construction at common locations out of sensitive areas	•	H
9.1	liaise with departments of Mines, Industry Regulation & Safety and Jobs, Tourism, Science & Innovation	•	H
9.2	seek to minimise impact of mining and petroleum operations	•	H
9.3	provide advice on native ecosystems to minimize impacts	•	H
9.4	explore mechanisms to recover costs from proponents' operations	•	H
10	maintain lists of threatened & priority species & ecological communities	•	H
11	develop, review and implement recovery plans	•	H

No.	Management Activity (abbreviated)	Achievement	C
12	use of Fauna Distribution Information System – harvesting and burning	•	H
13	approval of management activities within plantations	•	H
14.1	maintain a broad range of forest ages, structures and composition	•	H
14.2	operations with regard to <i>Goals for Understorey Structural Diversity</i>	•	H
14.3	management strategies that promote adaption to climate changes	•	L
14.4	review the CAR system as necessary	•	H
15.1	reference requirements to protect key habitat in codes and guidelines	•	H
15.2	values recorded, accessible to staff & considered prior to operations	•	M
15.3	set conditions to protect biodiversity during permitted disturbance	•	M
15.4	promote awareness and understanding of the value of biodiversity	•	H
16	fire operation guidance to minimise loss of legacy habitat elements	•	H
17.1	revise <i>Guidelines for Selection of Fauna Habitat Zones</i>	•	H
17.2	finalise locations of Fauna Habitat Zones (FHZ)	•	H
17.3	publish a map each year depicting FHZ and identifying any changes	•	H
18	conduct operations in FHZ and indicative FHZ according to guidelines	•	M
19.1	conduct biological surveys of priority areas	∇	H
19.2	use the surveys to review biodiversity conservation and CAR reserve	∇	H
19.3	record surveys in relevant data bases accessible to other users	•	H
20.1	maintain FORESTCHECK monitoring program and seek to extend it	•	H
20.2	maintain a research program on EFSM	•	H
21.1	maintain competent & sufficient fire management capability	•	H
21.2	maintain fire science capability & work collaboratively with others	•	H
21.3	consult on planning and implementation of prescribed burning	•	H
21.4	undertake annual prescribed burning program	•	H
21.5	undertake bushfire suppression operations according to guidelines	•	H
21.6	develop staff and contractor competency with environmental issues	•	M
22.1	FPC collaborate on bushfire risk mitigation strategies – timber	•	H
22.2	FPC provision of funding to control bushfire risk to acceptable levels	•	H
23.1	maintain surveillance and recording systems for significant weeds	•	H
23.2	collaboratively identify priority weeds using risk based-procedures	•	H
23.3	collaboratively prepare incursion plans for weeds not yet present	–	H
23.4	identify relative importance of areas for protection and controls	↗	M
23.5	implement coordinated control programs for priority weeds	↗	M
24	maintain weed science capability and work collaboratively with others	•	H
25	FPC minimise risk that seedlings transport unwanted weeds to forest	•	H
26.1	FPC maintain surveillance and recording systems for priority weeds	↗	H
26.2	FPC minimise spread & implement control programs for priority weeds	•	M
26.3	FPC control spread of plantation species beyond boundaries	•	H
26.4	FPC minimize risk seedlings transport unwanted weeds	•	H
27.1	maintain surveillance and recording systems for pests	–	H
27.2	work collaboratively with others on priority pests	–	H
27.3	prepare incursion management plans for priority pests not yet present	–	H
27.4	identify areas for protection & controls for pests already present	–	M
27.5	identify & protect individuals and populations that show resistance	–	M
27.6	encourage coordinated involvement in addressing pest species	–	M
28	maintain <i>Western Shield</i> program	•	H
29	maintain pest science capability & work collaboratively with others	•	H
30	FPC minimise risk that seedlings could transport unwanted pests	•	H
31.1	Plantations – FPC maintain surveillance for priority pests	•	H
31.2	use operational controls to minimize risk of introduction and spread	•	H
31.3	identify and protect individuals and populations that show resistance	–	H
31.4	minimize risk that seedlings could transport unwanted pests	•	H
32.1	surveillance & recording systems for forest diseases & syndromes	–	M
32.2	work collaboratively with other agencies to determine priorities	–	M
32.3	prepare incursion management plans for disease not yet present	∇	M
32.4	identify priority areas for protections & operational controls	↗	M
32.5	identify and protect individuals and populations with resistance	–	M

No.	Management Activity (abbreviated)	Achievement	C
32.6	encourage coordinated involvement in awareness and implementation	•	M
32.7	training & accreditation for consistent implementation – <i>Phytophthora</i>	•	H
33	maintain diseases & syndromes science capability & work with others	↘	H
34	FPC minimise risk that seedlings transport unwanted pathogens	•	H
35.1	Plantations – FPC maintain surveillance and recording systems	•	H
35.2	minimize risk of introduction and implement control programs	•	H
35.3	identify and protect individuals and populations with resistance	↗	H
35.4	minimize risk that seedlings transport unwanted pathogens	•	H
36.1	Mining - agreed rehabilitation & completion standards	•	H
36.2	verification that rehabilitation meets agreed completion criteria	•	H
36.3	explore performance bonds refundable on satisfactory handback	•	H
37.1	use natural regeneration where reasonable and practicable, or...	•	M
37.2	use genetics & traits to inform choice of areas for seed collection	•	H
37.3	where 37.2 not possible use seed from same or adjacent LMU	•	L
37.4	otherwise on approval use other seed sources including mixed sources	Not applicable	
38	report to Conservation Commission where other seed sources used	•	L
39	good practice applied to mining rehabilitation	•	M
40.1	develop guidelines for ongoing management of mine site rehabilitation	–	M
40.2	management intervention on mine site rehabilitation – changing climate	•	M
40.3	adaptive management approach to mine site rehabilitation	•	M
41	conduct operations involving heavy vehicles according to guidelines	•	M
42	revise documents - rehabilitation for extraction tracks, landings & roads	–	H
43	revise fire management documents – measures to minimise erosion	•	M
44	documents and training to address containment of spills	•	H
45.1	FPC Plantation operations give regard to guidelines for soil protection	•	H
45.2	FPC Plantations – rehabilitate damaged soil resulting from operations	•	H
46	operations in accordance with silvic, FHZ & soil and water guidelines	•	M
47	Department undertake or approve silviculture for ecosystem health	Not applicable	
48.1	treatment parameters for silviculture for water production proposals	Not applicable	
48.2	catchment management plans for silviculture for water production	Not applicable	
49	commission develop position statement on proposals to take water	•	H
50.1	advice & assistance – access to sub-surface and surface water	•	M
50.2	facilitate access to land for water extraction & associated infrastructure	•	M
50.3	Department will take and use water sustainably	•	M
50.4	may issue permits after consultation for the sustainable taking of water	•	H
51	apply phased harvesting requirements for salt sensitivity	•	H
52	planning to avoid salt risk in partially cleared catchments	•	H
53	FPC plantation operations conducted with regard to water protection	•	H
54	FPC plantations prepare catchment management plans if required	Not applicable	
55.1	knowledge on climate change impacts on ecosystems and yield	•	H
55.2	identify climate-impact refugia and implement strategies to maintain	•	H
55.3	maintain forest carbon science capability and work collaboratively	↘	H
55.4	report on carbon stores in the next draft FMP	Not yet due	H
55.5	incorporate climate change into future planning & management	•	H
55.6	contribute to State & national policy development adaption & mitigation	–	M
55.7	investigate opportunities from an emerging carbon economy	–	M
55.8	review guidelines to incorporate recognition of global carbon cycles	–	M
56.1	FPC Plantations remain abreast of knowledge on possible impacts	↗	M
56.2	encourage use of wood to maximise greenhouse mitigation benefits	•	M
57.1	minimise permanent loss of forest available for wood production	•	H
57.2	seek to replace native forest and plantation lost to development	•	H
57.3	promote construction of infrastructure at common locations	•	H
58	FPC Plantations meet State Agreement Act by replanting pines	•	H
59	FPC may replant clear-felled hardwood plantation to softwood	•	H
60	logs removed must not exceed 10 times annual average allowable cut	•	H
61	FPC may enter into contracts in addition to 60 above if approved	Not applicable	
62	FPC will prepare a timber industry development strategy	•	H

No.	Management Activity (abbreviated)	Achievement	C
63	sale of other species forest products is permitted where approved	•	H
64.1	Department prepare rolling 3 yr indicative plans in consultation - FPC	•	H
64.2	- consistent with allowable cut & volumes contracted by FPC	•	H
64.3	- approved by the Department	•	H
64.4	- made publicly available	•	H
65.1	FPC prepare annual timber harvesting plans approved by Department	•	H
65.2	- consistent with allowable cut and volumes contracted	•	H
65.3	- made publicly available	•	H
65.4	- varied at a coupe location or boundary level with prior approval	•	H
66.1	FPC prepare coupe level plans consistent with 65 above	•	H
66.2	- sufficient information to enable evaluation of proposed operations	•	H
66.3	- approved by Department prior to disturbance operations commencing	•	H
67.1	FPC and Department monitor quantity of all log products removed	•	H
67.2	- periodically monitor the grading and removal of sawlogs	•	H
68	FPC monitor and record areas of each different silvicultural treatment	•	H
69	Department maintain a process to verify 68 above	•	H
70	FPC provide suitable information - other than 1 st or 2 nd grade sawlog	↗	H
71	Department may use forest produce that becomes available	•	H
72	Department refine data and methods for sustained yield calculation	•	H
73.1	facilitate recovery of forest produce from other management activities	•	H
73.2	determine if wood from salvage harvest counts toward allowable cut	•	H
73.3	Develop guidance document - planning & approval of salvage harvest	•	H
74	Plantations FPC optimise yield & (where not inconsistent) other values	•	H
75	Plantations FPC prepare annual timber harvesting plans	•	H
76.1	Plantations FPC prepare compartment level plans consistent with 75	•	H
76.2	- provide sufficient information for Department to evaluate	•	H
76.3	- approved by Department prior to disturbance operations commencing	•	H
77	Plantations FPC monitor volume of all log categories removed annually	•	H
78	Plantations FPC operations in accordance with silvicultural guidelines	•	H
79	Plantations FPC record areas of silvicultural treatments each year	•	H
80	Plantations FPC refine data and methodology for yield calculations	•	H
81.1	Plantations FPC replant clearfelled areas (consistent with policy)	•	H
81.2	- rehabilitate clearfelled plantation not to remain as plantation	—	H
82	Plantations FPC maintain breeding programs to achieve outcomes	•	H
83.1	Other Exotics - programs with a view to future rehabilitation to natives	•	H
83.2	- assess before silvicultural or other treatments to determine if required	•	H
83.3	- undertake or reschedule treatment (83.2) according to assessment	•	H
84	Other Exotics – monitor and record treatment areas each year	•	H
85	- Department may seek proposals to facilitate rehabilitation to natives	•	H
86.1	Department regulate supply of other forest produce through licensing	•	H
86.2	maintain & prepare guidelines for management of other forest produce	•	H
86.3	monitor supply patterns for signs of non-sustainability	•	H
86.4	implement trials in selected areas for supply of public firewood	—	M
86.5	facilitate salvage of other forest produce where appropriate	•	H
87	FPC make wood available to small processors and craftwood artisans	•	H
88	FPC conduct native forest regeneration according to guidelines	•	H
89.1	FPC undertake native forest regeneration using natural regeneration	•	H
89.2	- where 89.1 not practicable - using genetic and life history traits	•	H
89.3	- where 89.2 not available - using material from same or adjacent LMU	•	H
89.4	- otherwise using other or mixed sources subject to approval	•	H
90	Department and FPC report to Commission for 89.2 & 89.3	•	H
91	FPC develop markets for log grades which are currently under utilised	↗	H
92.1	FPC develop silvicultural treatment programs to promote sawlogs	•	H
92.2	- assess stand development to determine whether treatments required	↗	H
92.3	- undertake or reschedule treatments according to 92.2 and markets	↗	H
93.1	prevent adverse effects on Noongar culture & heritage by consulting	•	H
93.2	- facilitate access for Noongar customary purposes	•	H

No.	Management Activity (abbreviated)	Achievement	C
93.3	- community consultation, involvement in decision making & surveys	•	H
93.4	- ensure compliance with provisions of the Aboriginal Heritage Act	•	H
94	work with appropriate groups joint management & customary activities	•	H
95	facilitate cross-cultural awareness and interpretive activities	•	H
96	in consultation, assess importance of Noongar culture & heritage	↗	H
97.1	develop guidance for management of other Australian cultural heritage	—	M
97.2	presence & type of heritage places recorded, accessible & considered	•	M
97.3	set conditions to protect heritage places during disturbance activities	•	M
97.4	awareness & understanding - staff proponents operators & visitors	•	M
98.1	conduct operations with regard to approved heritage guidance	•	M
98.2	co-operate with commonwealth, State agencies and others	•	M
99	processes that may result in reduced land base or restricted access	•	H
100	product mix that seeks to support a viable forest products industry	•	H
101.1	maintain understanding of visitor and recreation demand	•	M
101.2	support & plan for recreation & tourism & provide appropriate facilities	•	H
101.3	consider additional areas for off-road vehicle use in consultation	•	H
101.4	provide for the expansion of camping & caravanning facilities	•	H
101.5	work with water agencies to plan activities in water catchment areas	•	H
101.6	monitor & manage visitor use including regulating & licensing	•	H
101.7	seek to enrich visitor experiences & develop lifelong connections	•	H
102	reduce effects of development proposals on visual landscape quality	•	M
103.1	maintain & implement visual landscape classification & management	•	M
103.2	review and implement guidelines for visual landscape management	•	M
104	Plantations FPC consider impact of plantations of visual quality	•	M
105	review strategic access network with relevant stakeholders	•	H
106	seek resources to fund essential access infrastructure	•	H
107	retain develop & maintain strategic access for multiple needs	↘	M
108	design, construction and maintenance for unsealed roads - guidelines	•	H
109.1	BRM removals – comply with legislation, policy & guidelines - review	•	M
109.2	- contribute to government strategies including <i>State Gravel Supply</i>	•	M
109.3	- where practicable sourced from a network of (fewer) strategic pits	•	M
110	certified returns for BRM removals by government agency or LGA	↘	M
111	management guidelines for sterilised BRM	↗	M
112	database for BRM extraction & works programs for rehabilitation	↘	L
113.1	Provide advice on BRM proposals – timely rehabilitation of all pits	•	H
113.2	- cost of rehabilitation is borne by the organisation responsible	•	M
114	issue & administer leases and licenses for facilities, activities & uses	•	H
115	encourage development of Noongar enterprises within the plan area	•	H
116.1	administer agreements with bioprospecting companies	•	H
116.2	contribute to the development of modern bioprospecting legislation	•	H
117	planning checklist for disturbance activities - sufficient information	•	M
118.1	prepare a regulation policy for timber harvesting	•	H
118.2	develop & implement formal working arrangements	•	H
119	common training and accreditation programs for staff and contractors	•	H
120	prepare and / or revise subsidiary documents	•	H
121	develop a protocol for each key performance indicator	•	H
122	cooperate with Commonwealth – Montreal Indicators Program	•	H
123	conduct audits considering risk to achievement of FMP goals	•	H
124	report & publish audit results	•	H
125	FPC report audit results to Department & Commission & publish	•	H
126.1	address knowledge gaps including through benchmarking & research	•	H
126.2	work collaboratively with other agencies & institutions	•	M
126.3	transfer of new knowledge into improved management & operations	•	M
126.4	conduct and prepare policy on adaptive management	•	M
127	Plantations FPC – undertake audits and report	•	H
128.1	evaluate performance & determine if FMP should be amended	•	H
128.2	amend plan if required according to the CALM Act	•	H

No.	Management Activity (abbreviated)	Achievement	C
128.3	take action to address problems identified in management systems	•	H
129	initiate an expert review of silvicultural practices (2 nd half of this plan)	Not yet due	
130	undertake mid-term & end-of-term performance reviews	•	H
131	where performance targets not achieved investigate cause and report	•	H
132.1	Commission evaluate the need for revision of management practices	•	H
132.2	- provide advice through mid-term & end-of-term reviews to Minister	Not yet due	M
133	undertake public consultation - management policies & guidelines	⏏	M
134.1	provide community with educational opportunities & information	•	H
134.2	maintain public consultation processes	•	H
134.3	provide opportunities for community participation	•	H

