Forest Products Commission

Softwood Plantation Management Framework

Forest Products Commission

Acknowledgement

The Forest Products Commission (FPC) acknowledges the Noongar Nations that are the traditional owners of the Yued, Gnaala Karla Boodja, Ballardong, Whadjuk, Southwest Boojarah and the Wagyl Kaip and Southern Noongar forests and lands where we own and manage softwood plantations. We respect the Elders past, present and emerging.

The FPC is committed to meaningful engagement and reconciliation with first Australians.

Figure 1 -'Learning Together' by Noongar woman Diahane Riley - the staff choice winner from the FPC's 2022 Aboriginal Art competition

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Introduction

The Forest Products Commission (FPC) is shaping the forest product industry's future with our key priorities of timber production, forest health, and adapting to the challenges of climate change. Our objective is to supply essential timber products for the housing and construction industry in Western Australia, as well as for furniture, artisans, biofuel and other uses.

Since its inception, the FPC has conducted native forest operations under the direction of the Forest Management Plan (FMP) and the Department of Biodiversity, Conservation and Attractions (DBCA).

The FMP 2024-2033 signals a new direction and management approach for Western Australia's native forests. From 1 January 2024, the only timber removed from native forests is sourced from management activities that improve forest health (such as ecological thinning) or from clearing for approved mining operations and infrastructure. DBCA is the proponent of all ecological thinning activities and the FPC manages these activities under the direction of DBCA.

The FPC continues to own and manage Western Australia's public softwood estate, currently sitting at approximately 70,000ha on State and freehold land. The State Government's Softwood Plantation Investment Program is injecting $350 million over ten years to secure our softwood estate. Carbon sequestration from new plantations plays an important role in the State's response to climate change.

This document provides an overview of the FPC's management of softwood operations. Native forest management is described by DBCA in the FMP. Sandalwood is described in the FPC's Sandalwood Management Plan.

Vision, Values and Policy

The FPC's vision is to build and maintain an environmentally and socially responsible forest products industry that is financially viable and provides economic and social benefits to the people of Western Australia, particularly in regional areas through:

- delivering healthy forests for future generations; and
- ensuring efficient, effective and safe delivery of business outcomes.

The FPC operates responsibly, ethically, and sustainably. Our products and services provide renewable resources. The FPC is committed to achieving results and delivering excellent services to its customers, partners, the community and each other.

The FPC also commits to providing a safe workplace for its staff and contractors and puts the wellbeing and professional development of its people at the forefront of its business.

The FPC's Statement of Corporate Intent (SCI) describes how the agency intends to achieve its financial, industry, environmental and social objectives. The SCI complies with the requirements of the *Forest Products Act 2000* (FP Act) and represents an agreement between the Minister for Forestry and the FPC.

The SCI is consistent with the Strategic Development Plan which details a five-year view of the FPC's planning.

Forest management policy

The FPC's commitment to implementing practices that are environmentally sound, socially acceptable and economically viable is documented through our Forest Management Policy.

Legal and other requirements

The FPC is a Statutory Corporation and reports to the State Government through the Minister for Forestry. The FPC is governed by the FP Act, the *Forest Products Amendment Act (2022)* and sections of the *Forest Management Regulations 2020*. Section 12 of the FP Act requires the FPC in undertaking its activities to ensure:

- the long-term viability of the forest products industry; and
- the principles of ecologically sustainable forest management (ESFM) are applied in the management of indigenous forest products located on public land.

The FPC also operates in accordance with a wide range of legislative and other compliance requirements, including the FMP, which covers the southwest native forests and plantations in State Forest and Timber Reserves.

The FMP is a 10-year plan developed in consultation with key stakeholders across industry, conservation groups, State and Local Government and the community. It is the key policy framework for managing forests in the southwest of Western Australia. The FMP outlines strategic goals along with the management objectives and activities to achieve these goals. The FMP is developed in accordance with the principles of ESFM and the requirements of relevant State and Commonwealth legislation.

Prior to the FMP's implementation it is reviewed by the Environmental Protection Agency (EPA) and approved by the Minister for Environment. More information about the development of the FMP is available on the DBCA website. The DBCA and the Conservation and Parks Commission oversee compliance with the FMP.

The FPC manages softwood plantations on State tenure and freehold land. Plantations on private property are subject to the relevant State and Commonwealth legislation, as well as Local Government by-laws. Some private property plantations are referred to as sharefarms and operate through profit-a-prendre arrangements. Other properties are owned and managed directly by the FPC. Further plantation investment is being undertaken on freehold land.

The FPC manages its plantations to the Code of Practice for Timber Plantations in Western Australia.

The FPC undergoes routine audits to the Australian/New Zealand Standard for Sustainable Forest Management (AS/NZS 4708:2021) in accordance with the standard's requirements. Further information about these standards and our summary audit reports are available on the FPC's Certification web page.

The FPC's Softwood Plantations

Softwood sawn timber produced from FPC plantations is primarily used as a structural grade timber and provides up to 70 per cent of the pine products for the State's housing and construction market. The demand for housing resulting from ongoing population growth has highlighted the importance of a local, well managed resource.

The FPC manages approximately 70,000 hectares of softwood plantations in the South West of Western Australia. The softwood species radiata pine (*Pinus radiata*) and maritime pine (*Pinus pinaster*) have been planted over many years to help reduce Australia's reliance on imported timbers. Plantations are located on State owned land, freehold land and secured under sharefarm agreements on private land. FPC plantations extend from north of Perth, throughout the South West and in areas surrounding Albany and Esperance (see Figure 3).

The softwood estate supports a timber industry hub at Dardanup which includes a sawmill and timber processing plant, wood chipping facilities, wood treatment facilities, and a particleboard plant. There is also a Laminated Veneer Lumber engineered wood processing facility at Neerabup, north of Perth.

Figure 2- Young pine plantation in the hills near Nannup

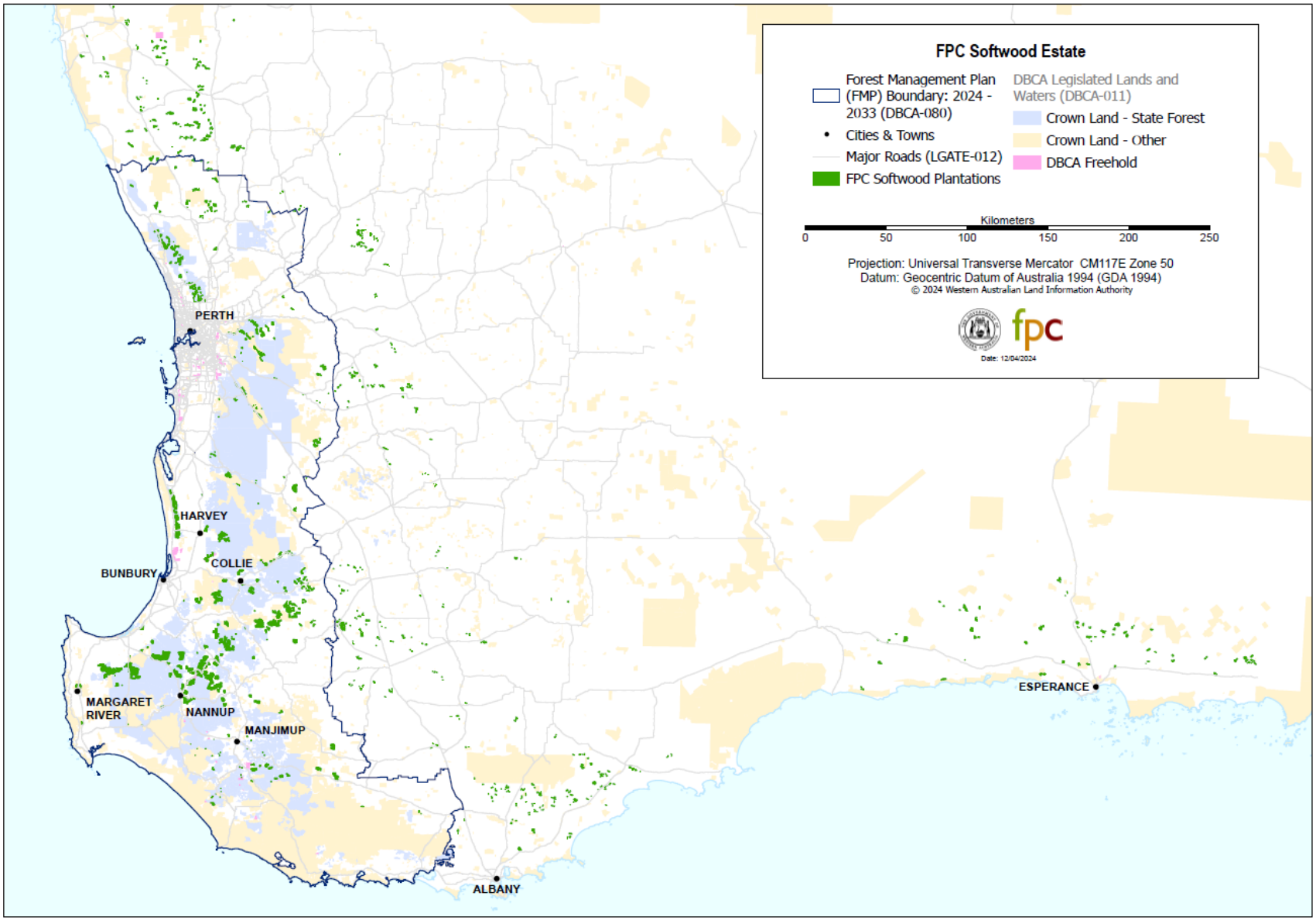

Figure 3 - Map showing distribution of the FPC's softwood plantations in south west Western Australia

History

By the 1950s it was recognised that Western Australia's native hardwood resources would not meet the future timber needs of the State. Pine was identified as a fast growing and high-quality alternative that would assist in Western Australia being relatively self-sufficient in timber.

Most of the softwood plantations in Western Australia were established by the State Government between the 1960s and mid-1990s. These were grown on farmland and, at the time, what was deemed 'poor quality' native forest. However, by 1984, changed government policy halted any further clearing of native forest for plantation establishment.

Since the 1990s, smaller scale private investment in softwood plantations occurred and a more substantial investment through a range of share-farm arrangements between private landowners and the State Government. These arrangements commonly involved sharing of the risk and return between the parties involved through crop share agreements. The crop share was agreed at the time of establishment and vary according to the specific agreement.

There has been underinvestment in State pine plantations since the 2000s and with reductions in sharefarm areas as the agreements expire, this has led to a projected shortfall in available timber. The FPC's resource projections show that without substantial new investment, the plantation estate will contract significantly over the next 20 years.

The State Government's 2021 announcement of a $350 million investment to secure the softwood plantation timber estate over the next 10 years will help to mitigate the otherwise diminishing resource base. The Softwood Plantation Investment Program is based on land purchase to ensure the longevity of WA's timber supply.

Species selection

Radiata pine, also known as Monterey pine, has a very small natural distribution in Southern California and several Mexico islands. This modest origin belies its huge influence on world forestry. Its original name was 'remarkable pine', given its adaptability, fast growth and high-quality timber. Radiata pine is generally suited to areas receiving greater than 600 mm rainfall and the deeper loamy gravels in the South West and Great Southern regions of WA. The timber supports significant processing businesses primarily producing structural timber, laminated veneer lumber (LVL) and particle board for Australian markets.

Maritime pine originates from southern Europe and the western Mediterranean. It is suited to the intermediate rainfall areas greater than 400 mm and deeper sandy soils of the Swan Coastal Plain, the central Wheatbelt, Great Southern and South Coast. The timber is primarily utilised to produce LVL for use within the building industry.

These two species originate from areas with similar climatic conditions to south western Australia and are able to thrive in our cool wet winters and hot, dry summers.

Small amounts of other species of pine such as Canary Island Pine and Turkish or Brutia pine have also been trailed on a very limited scale.

Pines have the potential to become invasive weeds in Australia. While many areas adjacent to plantations remain free from invasion, dense wilding infestations have been observed within and adjacent to older plantations within native forest. These wildings suppress native species, compete with existing plantation trees and increase fire risk. Wildings can be manually felled, and when large enough they can be commercially utilised. Small wildings can be controlled with low intensity fire. Frost and dense shade limit the spread of seedlings.

Figure 4- An FPC officer walking through a mature pine plantation

Forest Values

Key to sustainable forest management is the identification and protection of forest values. Values in plantations can include cultural and social aspects, or be related to biodiversity, soil, water and related ecosystem services.

A comprehensive disturbance checklist is completed prior to FPC operations to identify existing values and to mitigate any threats plantation activities may pose. For activities on DBCA tenure within the FMP area, this checklist is approved by the DBCA.

Biodiversity

The South West of Western Australia, an area extending from north of Kalbarri to east of Cape Arid, is recognised for its exceptional biodiversity. It is home to approximately 7,400 species of vascular plants, half of which are endemic to the region. Long isolation, climatic shifts and nutrient poor soils have contributed to unique species and ecosystems. The majority of original vegetation in the vast area is made up of semi-arid woodlands, shrublands and sandplains.

The region is recognised as a global biodiversity hotspot by Conservation International. The criteria for a biodiversity hotspot are to have at least 1,500 endemic vascular plant species and 30% or less of its original natural vegetation remaining. Overall, the South West province contains 30% of its original vegetation, with much of the historical clearing having been implemented for agriculture.

Current and emerging threats to biodiversity in the region include: climate change related reductions in rainfall and changes in rainfall patterns; increased wildfire intensity and frequency; feral animals (cats, foxes, pigs, goats, rabbits, horses); *Phytophthora cinnamomi* (jarrah dieback disease); weeds and soil degradation.

The FMP provides more detailed information on the values and threats in our region.

Responsible management of our softwood plantations can provide benefits to biodiversity and ecosystem services. Although not comparable with native forest, plantation environments with connection to remnant and native vegetation are able to support greater species richness than agricultural land alone. Plantation trees can also provide cover, improve soil and water quality, store carbon, reduce ‘edge effects’ and act as corridors for wildlife.

Plantations will often encompass areas of remnant native vegetation, paddock trees and riparian (stream) zones. These remnants can vary in terms of their environmental condition, and often are impacted from previous land use such as grazing. However, all remnants can offer some environmental value through the provision of habitat and ecological functions. Older trees with hollows are of particular importance for nesting wildlife. The ecological role of dead and fallen timber is recognised. Remnant vegetation is protected from plantation operations.

Significant biodiversity values such as threatened species may be identified through the disturbance checklist, through general observation or by stakeholders. When this occurs, consultation is initiated with DBCA and stakeholders to determine the appropriate management actions.

There are occurrences of threatened flora and ecological communities within or adjacent to several FPC plantations. The FPC works closely with DBCA and relevant stakeholders to ensure the ongoing protection of biodiversity values.

Pine plantations are known to provide feeding and roosting habitat for the Carnaby's, Baudin's and Forest Red-tailed Black Cockatoos. All three species are classed as threatened and have been affected by habitat loss through historical land clearing. Baudin's and Forest Red-tailed cockatoos occur throughout the forested areas of the South West and feed primarily on marri and jarrah (DEC, 2008).

Pine nuts however, have become a high value food for Carnaby's cockatoos which will travel great distances to access them. Pine in the Pinjar, Gnangara and Yanchep regions is particularly important for Carnaby's cockatoos in the Swan Coastal Plain, where urbanisation has greatly impacted the landscape (Finn *et al* 2009). In 2023, the State government announced 1,800 ha of plantation pine in Gnangara scheduled for harvesting would be preserved as critical habitat for Carnaby's cockatoos.

Figure 5 – View of a road running through young pine plantations near Nannup

Cultural and Heritage

The FPC recognises the Noongar people as the traditional owners of the lands and waters of South West Western Australia and specifically on lands upon which the FPC carries out planning and operational activities. The FPC acknowledges the connection that Noongar peoples have with the land and waters, in addition to ensuring the protection of specific Noongar heritage sites.

Noongar people may be authorised to access land managed by DBCA to undertake customary activities. The FPC will facilitate such access where it relates to plantation areas the FPC manages.

The operational planning process considers the presence of cultural or heritage values within the vicinity of a plantation. The FPC follows due diligence guidelines and in consultation with stakeholders identifies the appropriate management strategies to preserve the values.

The FPC will provide an activity notice to the relevant Aboriginal corporation as required by the Noongar Standard Heritage Agreement 2016 (NSHA) for activities that may impact Noongar heritage. Low ground disturbance activities, as agreed in a Letter of Understanding between the South West Aboriginal Land and Sea Council (SWALSC) and the FPC, do not require an activity notice.

Soil and Water

Softwood plantations can positively impact soil and water values, particularly when compared with agricultural land. The long harvest cycle (up to 35 years) acts as a weed and pest break from repeated cropping and restores a deep soil structure by maintaining macropores for deep drainage and replenishing resistant soil carbon (woody material in roots), necessary for soil biota.

Compared to annual cropping, reduced regular and repeated fertiliser and chemical inputs lessen the likelihood of any events of nutrient leaching and contamination. Pine needle litter creates a rich layer of humus and biological activity. Pines are efficient in nitrogen usage and recycle a significant proportion of their nutrients once canopy closure is reached. The bulk of nutrients are carried in the crown and needles of the tree which are not removed from the site once harvested. Productive pasture can be quickly re-established from ex-pine plantation.

Well managed plantations can reduce runoff, erosion and stabilise stream flows. However, plantations that are poorly managed can degrade water quality through soil erosion from surface water runoff, nutrient and chemical contamination from fertiliser, pesticide and hydrocarbon residues.

Plantations can increase water use and lower water tables. While this can be of benefit in salinity management, reductions in groundwater recharge can become problematic for some adjacent land uses dependent upon streamflow for water supply, recreation or other values and this can be exacerbated by reduced rainfall and climate change.

The FPC's plantation management is implemented to protect soil and water values. Consideration of topography and soil types, restricted zones around riparian areas, controlled stream crossings, earthworks for erosion control and restrictions in wet weather operations are standard practice.

Extra restrictions are in place for plantations within Public Drinking Water Source Areas (PDWSA) (See Water Quality Protection Note 121 – Plantations in public drinking water source areas) and these operations are overseen by the Department of Water and Environmental Regulation (DWER).

Figure 6 - Young pine tree in the Blackwood Valley landscape

Carbon

Through photosynthesis, carbon is extracted from the air and used by the tree to build its tissues in the process of carbon sequestration. Removal of carbon dioxide from the atmosphere helps to mitigate the effects of climate change. When plant material breaks down, much of the carbon is added to the soil as organic matter. Harvested wood products continue to act as carbon storage as long as the product remains. When wood is burnt, carbon is released back into the atmosphere.

Forestry is a relatively unique sector in the economy in that it has capacity as a net carbon 'sink', effectively absorbing more carbon than is released.

The Softwood Plantation Investment Program is a key action of the Western Australia Climate Policy as it is projected to sequester up to 8 million tonnes of carbon dioxide equivalents. To facilitate this, the Forest Products Act 2000 has been amended to enable the FPC to purchase land, trade in carbon credits and generate revenue for the West Australian community from the carbon sequestered in our softwood estate. Several new plantations have now been registered as carbon sequestration projects under the Emissions Reduction Fund.

In partnership with the Water Corporation the FPC is progressing the establishment of around 1,480 hectares of new pine plantation on two properties owned by the Water Corporation in the South West. Under this arrangement the Water Corporation will receive the carbon credits generated by the planting while the FPC will manage the commercial softwood plantations. The FPC also has similar arrangements with private sector companies.

The 2023 carbon estimate for the FPC's softwood plantation estate (72,565 ha at time of calculation) is 4,618,403 tonnes of Biomass Carbon. This estimate was calculated for above and below ground Biomass Carbon using formulas derived from Snowden *et al* (2000).

The Plantation Management Cycle

West Manjimup Nursery and Seed Centre

Figure 7 - A sea of green pine seedlings at the FPC's West Manjimup Nursery and Seed Centre

Located in West Manjimup, the FPC's Manjimup Nursery and Seed Centre produces superior seed and seedlings for the establishment of softwood plantations and for activities that support regeneration of native forest and sandalwood.

The Nursery utilises a fully containerised production system and has the capacity to deliver millions of seedlings annually. Pine seed is generally sown in November and grown through the summer to be ready for planting in winter (June/July).

Rigorous controls are in place at every step of the process - from collection, sowing, germination, transplanting, irrigation and fertilisation to dispatch - ensuring a reliable, superior quality product is delivered. High standards of nursery hygiene and management practices ensure seedlings leave the nursery with the greatest opportunity for success following planting.

The Manjimup Nursery and Seed Centre operates under the Nursery and Garden Industry of Western Australia's (NGIWA) Nursery Industry Accreditation Scheme and is a back-to-back winner of the NGIWA Award for Best Large Production Nursery.

Land Acquisition

In Western Australia, pine plantations are only established on previously cleared land, with the preceding land use generally being agricultural land or eucalypt plantation. Sustainable forest management practices and State government policy clearly prohibit the clearing of native vegetation to establish plantations.

Through the Softwood Plantation Investment Program, the FPC seeks to acquire land and establish plantations on land that meets its site requirement guidelines. The primary factors involved in site suitability assessment are climate, soil quality and depth, and distance to market.

In determining the suitability of a site, a detailed site and soil assessment is undertaken, accounting for rainfall, soil types (depth, colour and texture), occurrence of salinity, site fragility, remnant vegetation, social and environmental values. This informs any special management actions that may be required.

Planning

Plantations require thorough planning to enable effective establishment, scheduling and resourcing and to ensure the FPC meets its compliance requirements. Planning identifies values for protection, stakeholders, and risks and issues that may be associated with plantation activities.

A plantation management plan is developed for each plantation on freehold land, in accordance with the relevant codes of practice. These plans document site characteristics and history, sensitivities of the property, silviculture planning, fire management and a plan for the timber harvest.

Activities on DBCA managed lands require application through the Disturbance Approval System (DAS). The DAS provides a comprehensive, consistent approach to assessing activities that may impact on values and sensitivities and sets meaningful conditions to a proposal. DAS are valid for between 12 months and three years from the date of authorisation.

On private property, the FPC conducts an internal disturbance checklist, similar to the DAS, prior to activities. These approvals remain valid for three years.

Site Preparation - first rotation

Site preparation is essential for successful plantation establishment and is tailored to each plantation. Preparation works may involve clearing existing post-harvest debris, cultivation, weed control and the use of appropriate strategies to modify the soil structure to improve survival and early tree growth. Some form of soil preparation is beneficial on most sites.

Natural drainage is considered prior to implementing preparation work, particularly as surface water run-off can increase significantly after mounding and weed control and cause erosion.

Stump grinding/mulching is prescribed for some sites previously established as eucalypt plantations, which are now being converted to softwood. Eucalyptus coppice is mulched, with the stump ground down below soil level. This provides optimal conditions for softwood timber production and replaces the need to spray out eucalypt coppice.

Shallow ripping to 40-50 cm depth is prescribed on first rotation sites. Ripping or rip mounding (ripping with bedding plough) improves tree growth by concentrating topsoil nutrients, alleviating soil compaction and allowing moisture infiltration.

Mounding is the normal practice on sandy soils and sites subject to periods of waterlogging. Sandy soils in Western Australia are generally infertile, with most nutrients occurring in the topmost 15 cm of the soil. Mounding concentrates this nutrient rich topsoil and provides a significantly improved medium into which to plant seedlings and promote root development. On wet sites, mounds raise the tree above the waterlogged zone and if orientated carefully will provide cross-surface drainage of water.

An alternative to mounding on non-wetting sandy sites is furrow-lining. This breaks the non-wetting surface and allows moisture to penetrate down to the root zone of the seedling, and by planting the seedling in the furrow, below the normal soil surface level, desiccation by wind is reduced.

Site Preparation – second and subsequent rotations

The second rotation strategy for *P. radiata* and *P. pinaster* plantations promotes the retention of logging debris to conserve nutrients and reduce erosion.

There is considerable evidence to support the retention of logging residue in pine plantations. Conserving debris maintains or improves the growth of a subsequent crop of pines, particularly on sandy soils. Studies indicate that the conservation of organic matter and nutrients (especially nitrogen) are the primary factors influencing the productivity of sandy soils and are also likely to be relevant to more fertile soils. Exclusion of fire and retaining surface mulch from logging residue are significant factors in reducing the level of weed competition in second rotation plantations. This enables the use of lower rates of herbicide than is usual for first rotation establishment.

Controlled burning of debris may be utilised according to individual site requirements.

A chopper roller may be used to break down debris to allow for access and cultivation. Debris that is too large for this and will impede establishment is heaped into windrows and burnt.

Establishment – planting

Planting begins when sufficient moisture is available in the soil profile. Seedlings are planted by hand along prepared rows using potti-putkis. Machine planting is currently being trialled.

Planting quality is monitored to ensure correct techniques are applied for seedling survival.

Seedlings are planted at a stocking rate determined by site suitability and capacity.

All newly established plantations are assessed for survival in the autumn following planting, when deaths from drought or insect damage will be apparent. Where results indicate understocking, infill planting occurs the following winter.

Figure 8 - Pine seedlings planted along mounds on a first rotation site.

Nutrition

If determined necessary through soil testing, fertiliser is applied by hand to deliver a measured dose near the base of each seedling shortly after planting.

FPC officers monitor the progress of the plantation over its lifetime and will prescribe fertiliser applications if nutrient deficiencies are identified through foliar and soil analysis. Additionally, routine fertiliser applications are scheduled after both first and second thinning operations.

Maintenance

Plantations are monitored frequently during the first twelve months after establishment for pest damage and drought deaths. In subsequent years, plantations are monitored every three to six months. Weeds, pest damage, tree health, firebreaks and road conditions are some of the elements observed. Actions are initiated for identified concerns.

Figure 9- Inspection of recently planted pine seedling

Chemical Use

The FPC uses an integrated pest management approach to limit the use of chemicals where possible, but they can be necessary to control problem weeds, pests or disease within a plantation environment. The FPC only uses Australian Pesticides and Veterinary Medicines Authority (APVMA) approved chemicals and observes due process for ensuring their safe and environmentally responsible handling and use.

Grazing

After trees have become established at 3-4 years, livestock grazing may be introduced where fencing is in place and any sensitivities are not impacted. Grazing assists in fire mitigation by reducing fuel levels, while providing income for the FPC and the livestock manager. It also assists with maintaining positive relationships with neighbours and local shires.

Pest animals

Feral goats, sheep, pigs, rabbits and horses are present throughout the South West and can cause significant damage to establishing plantations and native ecosystems.

To address these challenges, the FPC's silviculture team implements a comprehensive management strategy, which may include regular monitoring of invasive species populations, fencing to protect vulnerable areas, and targeted removal programs.

Remnant vegetation and riparian zones

Areas of remnant vegetation within or adjoining plantations may be present in the form of small areas of open forest or shrubland. They vary in their ecological condition and many have been subject to grazing prior to plantation establishment.

Remnant vegetation is protected from plantation activity, regardless of its condition. Remnants within the FPC's management area are monitored for weeds and pine wildings and appropriate action is taken when required. The burning of remnant vegetation for fuel reduction and asset protection may be considered.

Riparian zone is the term given to the interface between land and water, such as stream edges and banks. These zones are of particular value in maintaining water quality and biodiversity throughout the landscape. Riparian zones are protected from all plantation activities with a suitable buffer. Prior to operations, any stream crossings are assessed for suitability and only approved crossings can be used.

Pruning

At 7 years of age, plantation trees alongside roads and firebreaks are considered for tree pruning. This assists in fire mitigation and ensuring firebreaks and access roads comply with requirements. Pruning involves removing the branches up to a height of 5m. This is performed from the ground with hand saws, loppers, chainsaws or pole saws.

Inventory

To enable effective resource planning, an inventory program plans and measures plots across the FPC's plantations. The measurements captured are used to calculate the current stand resources and project yields into the future. The information generated from the inventory activities is essential for strategic, tactical and operational decisions.

Figure 10 - Mature pine plantation

The inventory assessments occur in different ages of the plantation. The main assessments are:

- Early rotation inventory (ERI) undertaken on stands aged 7.
- Post thinning inventory (PTI) in stands that have had a harvesting event.
- Permanent Sample Plot (PSP) measured in three yearly intervals.

Additional temporary assessments are required for assessing damage caused by force majeure events, like wildfires, windthrow, drought or for modelling and calibration purposes.

The FPC inventory applies a Site Quality methodology, which classifies the sites by similarities of soil and climate characteristics. The FPC Inventory Team uses multiple tools and software to measure and calculate the forest resources. In the planning phase of the assessments, the plots are spatially allocated to each Site Quality with a calculated intensity of plots required for the area. The plots have a circular shape and have size that varies according to the number of trees per hectare.

The plots are located by GPS and demarcated infield. The plot trees are measured for diameter at breast height (1.3m) and a proportion have their heights taken using a Vertex clinometer. The field data gathered is validated through desk and field checks.

This inventory data is processed to project future yields and supports the business in many aspects, including development of strategic, tactical and operational planning, silvicultural and marketing decisions, forest health, salvage recovery plans and fertilising programs.

Roading

In new plantations, roading and firebreaks are installed for plantation establishment and maintenance activities.

Prior to commencement of harvesting activities, roads must be in suitable condition for heavy haulage and have the appropriate approvals in place. The FPC coordinates the planning, construction and maintenance of roads used during its operations to allow Restricted Access Vehicles (in this case, 27.5 metre long road trains) safe and legal access to FPC's operations.

The FPC uses bitumen and gravel roads under the care and control of DBCA, Local Government, Main Roads WA, as well as privately owned and FPC owned roads for haulage. The FPC contributes to the maintenance and occasionally the construction of these roads to facilitate its operations.

Appropriately equipped and experienced local businesses are contracted by the FPC to perform these tasks. Specialised road plant such as graders, rollers, tip trucks and water carts are used to haul and place road materials such as gravel and limestone.

Thinning / Selective Harvesting

Thinning or the selective harvesting of trees can occur several times throughout the lifecycle of the plantation. This is undertaken to remove competition and allow the remaining trees to grow and later be harvested for higher value products. Thinning improves resilience of the remaining trees in times of drought and water deficit.

Establishing plantations at high stocking rates enables full occupation of the site, reduces competition from weeds and allows selection of the best trees for the final crop, maximising productivity. The strategic removal of young trees via thinning helps influence the growth, quality and health of retained trees while culling smaller and malformed trees.

Thinning provides an intermediate return from the plantation by producing secondary products, such as industrial wood, pine rounds and small sawlogs. The removal of extraction rows to access the stand aids in tree removal and access for plantation tending operations.

FPC plantations are generally thinned twice in each rotation, with the first thinning optimally between 10 and 15 years of age. A second thinning may be undertaken at 18-25 years. Planning of the thinning regime considers the number of trees/ha currently standing, stand health and the expected outcomes considering soil type, rainfall and terrain. For example, on steep sites only one thinning may be prescribed, while on high quality sites three thinnings may be scheduled. Thinning regimes will account for variations in site potential, previous management history and product requirements. The potential for drought impacts in a drying climate also need to be considered.

Final Harvest

The final harvest operation is the clearfall of all remaining trees, generally at 25-30 years.

The FPC plans each operation strategically according to the site and conditions. The FPC harvest plan ensures the efficient and sustainable harvest of softwood trees, utilising appropriate machinery and techniques. It aims to minimise environmental impact and maximise operational efficiency during the final harvest operation.

The FPC engages state-of-the-art harvest machinery, equipped with software that analyses the optimal utilisation of every tree. The computer predicts the most volume of high value product that can be cut within the supplied customer specifications. This prediction starts from the first falling cut and is on average re-calculated every 10cm. The FPC then receives this raw cutting pattern data for analysis.

Mechanical harvesters are used to fell trees. Harvesters feature a cutting head that fells, delimbs, and cuts trees to specific lengths, referred to as 'cut-to-length' operations. Forwarders transport the logs along extraction tracks to the landing area where they are stored, ready for loading onto trucks. In poorer quality stands, infield chippers may be used. Logs are fed into the woodchipper with the resulting woodchips loaded directly into trucks.

Figure 11 - FPC officer making contact during a harvesting operation via two-way radio

All active harvest operations are dangerous for visitors and access is restricted. No unauthorised access is permitted. Signage displaying call up channels, required PPE and evacuation points are erected at each entrance. Arriving and departing vehicles must call up on radio and be acknowledged by the crew. Authorised vehicles and pedestrians must keep at least two tree lengths clear of working machinery.

Fire Salvage

If a plantation is damaged by fire, the FPC conducts an assessment on the need and viability of a salvage harvest. The age of the trees, severity of the fire, markets, pricing and haul distance are factored into the viability. If salvage is deemed feasible, a Fire Management Plan is developed for the plantation.

Time is critical to maximise salvage of high value products, as burnt trees will rapidly degrade in quality over time. After the fire has been controlled, heatseeking surveys detect any remaining hotspots and these are mopped up by fire units. Ideally, salvage harvest begins within 6 weeks of the fire event. The intensity and scale of the fire will influence the duration of harvest activity.

Figure 12 - Charred pine logs being assessed during a fire salvage operation

Haulage

Commercial products from the harvest are loaded onto haulage vehicles and transported by road to local processing facilities.

The FPC is committed to reducing the risks associated with the haulage of forest products from FPC managed work sites and compliance with Chain of Responsibility (CoR) legislation. Heavy vehicles engaged in haulage activities on behalf of the FPC are monitored using the FPC's Deliveries and Billing system.

The FPC monitors compliance with CoR legislation. The FPC and its contractors both have an obligation to monitor load weights. Where an overload is detected an investigation will be conducted and remedial actions implemented.

Figure 13 - A forwarder loading pine logs onto a truck for haulage

The FPC is working with its contractors to improve road safety, with haulage identified as a critical risk. Initiatives include human factor training, In Vehicle Monitoring Systems to identify and manage fatigue and distraction events in real time, vehicle tracking systems to monitor speeds and installation of electronic braking and stability control systems.

Haulage operations occur on roads administrated by the Parks and Wildlife Service, local governments and Main Roads Western Australia. The FPC liaises with these agencies to ensure approvals are in place and the condition of roads is maintained.

Noise, dust and conflicts with other road users from log haulage operations can be an issue particularly in areas adjacent to private property. Log haulage is carefully managed to minimise disruption to road users and other stakeholders including neighbours.

Chain of Custody

The origin of harvested material must be identifiable at all points on the supply chain. This Chain of Custody (CoC) gives consumers confidence that wood products originate from legal sources, and in the case of certified product, meets the requirements for the Australian and New Zealand Standard for Sustainable Forest Management (AS/NZS 4708:2021).

An operations code is allocated for each operation, indicating the district, plantation name, compartment and treatment type. The code is included in the Electronic Delivery Notes (EDN) which must accompany each truckload. EDN's verify the source, product type, amount and certification status of the product and demonstrate it has originated from an authorised harvesting operation.

Any material of differing certification status is kept segregated to avoid contamination of certified material. Chain of custody processes are audited regularly to verify compliance.

Figure 14 - Diagrammatic representation of the chain of custody for forest products

Softwood Products

The FPC manages its plantations to produce timber to satisfy a range of markets and end-products, and to optimise full resource utilisation at all stages of a plantation's life.

Sawlogs are predominantly used to produce timber products for use in construction by Wespine under State Agreements. Wespine produces approximately 70% of pine structural grade timber for the WA housing market and landscape timbers such as sleepers, fencing products and packaging timber.

Laminated Veneer Lumber (LVL) is an engineered wood product and is produced by Wesbeam under State Agreement with material from second thinnings and final harvest. The product is made by bonding together rotary peeled or sliced thin wood veneers under heat and pressure. It has many advantages over traditional building products, being stronger, straighter, more uniform and can be manufactured to almost any length. It is used for permanent structural application including beams and rafters.

Industrial wood not suitable for structural applications or LVL is sold into markets to be used for fencing posts and other products, such as particle board produced by Laminex.

Pine residues are sold into markets to be utilised for chipping, mulching and biomass for bioenergy plants. Bioenergy markets include pellitised fuels or replacing or co-firing with non-renewable sources in existing power generation facilities.

New market innovations are also driving opportunity to utilise industrial woods and residues such as for greener plastic alternatives known as Nano Crystalline Cellulouse (NCC), and for use as soil enhancing products known as biochar.

Figure 15- Pine timber used in construction

Forest Health

The FPC is committed to monitoring and managing forest health related issues within the plantation estate, as described in the FPC's *Forest Health Monitoring Plan*. As part of this plan, the FPC identifies and manages biotic damaging agents (*i.e*. pests, weeds and diseases), as well as abiotic damaging agents including drought, fire, nutrition deficiencies and anomalies, wind damage and waterlogging.

The FPC is also committed to minimising the risk of introduction and spread of 'declared pest' species within its estate, as required under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and *Biosecurity and Agriculture Management Regulations 2013* (BAM Regulations). To carry out this work, the FPC works closely with the Department of Primary Industries and Regional Development (DPIRD), which is the lead biosecurity agency in WA. The FPC also has response plans in place to respond to incursions of declared pests.

The FPC monitors its estate for forest health related issues through routine plantation inspections as well as utilising remote sensing. The FPC has been developing a system to use satellite imagery and normalised difference vegetation index (NDVI) to monitor annual canopy cover changes across its entire softwood estate. Any plantation areas identified with significant decline for unknown reasons are then further investigated through site inspections to help determine the reason for the decline.

Each year, all new plantations, and all plantations which have just had a first or second thinning event, are also assessed for their soil nutrient status. These nutrient measurements at each site, in association with tree age, soil type and rainfall zone, help the FPC to determine the most appropriate site-specific fertiliser regime to apply.

Research and Innovation

The FPC participates in or contributes to research and innovation to maximise the value recovery of forest resources and to improve forest health. Areas of focus include improved genetics in plantations (see Tree Breeding), optimising fertiliser regimes and remote sensing. The FPC is a research partner of Forest & Wood Products Australia (FWPA) and a member of their Grower Research Advisory Committee (GRAC).Currently the FPC is investigating the use of remote sensing technologies such as LIDAR (Light Detection and Ranging) to improve the quality of log volume predictions, satellite imagery to monitor forest health and high-resolution (1 cm) UAV photography to assess the success rate of newly established plantations. Adopting remote sensing technologies will lead to more detailed, timely knowledge of the forest, and enable better decision-making in planning and implementing silvicultural and harvesting operations across the FPC.

Figure 16 - The FPC is investigating the use of drones and remote sensing technology to monitor seedling survival

Tree Breeding

The FPC has a long history of genetic breeding programs across a range of both softwood and hardwood species. Trees are selected for superior qualities, including growth rate, stem form, branching characteristics and wood quality. Other characteristics such as tolerance to disease and a drying climate are also considered as part of an overall breeding program.

The FPC's *Pinus radiata* breeding program builds on over 50 years of scientific research in WA, and through the FPC's membership to Tree Breeding Australia (TBA). Superior material created through control pollination is tested through a network of field progeny trials, where elite material is selected for inclusion in the FPC's seed orchards for deployment into plantations. These seed orchards are subsequently managed to ensure the reliable production of seed, ultimately improving the productivity and quality of the FPC's plantations.

Figure 17 – Seedlings produced at the FPC's West Manjimup Nursery and Seed Centre are the result of many years of breeding programs

Fire Protection and Management

Plantations are an important long-term asset for the State, and fire protection is critical to the security of this resource. Uncontrolled spread of wildfires can have a substantial impact on the environment, economy and local communities. As the investment in the softwood estate increases over coming years, it is important that fire mitigation measures and response structures are in place to protect both the plantation estate and associated regional communities from the threat of bush fire.

The FPC works in close cooperation with the DBCA, Department of Fire and Emergency Services (DFES), local brigades and private forest management companies to plan and deliver fire mitigation and response measures designed to protect Western Australia's plantation forests. The FPC's staff are important contributors to joint agency emergency response arrangements.

The FPC's Community Fire Protection grants were launched in 2023 to support volunteer fire brigades and other relevant organisations with their fire prevention, preparedness, and response activities. The program prioritises applications that align with the FPC's strategic focus linked to its Softwood Plantation Investment Program; increase understanding of plantation fire management; and deliver the greatest benefits to local communities.

The FPC's plantations are managed in accordance with relevant guidelines from DFES and the Forest Industry Federation of Western Australia (FIFWA). A Fire Management Plan is developed for each plantation which includes response information such as the location of firefighting water supplies and the placement and extent of firebreaks. A copy is kept onsite in a red canister near the entrance to the plantation.

For every harvest and silvicultural operation, the FPC requires contractors to have firefighting equipment onsite, proportional to the fire risk of the operation. Compliance checks, drills and training prepare personnel for responding to fire events.

Planned burns are important silvicultural and fire mitigation tools. Appropriate fire regimes in native forest ecosystems help to promote natural regeneration, forest health and biodiversity, and where adjacent to plantations, provide protection against wildfire. The DBCA has primary responsibility for managing fire within areas covered by the FMP, and part of this involves prescribed burning to reduce fuel build up. The FPC provides assistance to the DBCA burn program. Controlled burns also provide valuable training opportunities for staff developing their fire management skills.

More information about fire management is included in the FMP and in the FPC's Plantation Fire Management and Protection.

Figure 18 - Fire fighters mopping up after a fire event

Stakeholder Engagement

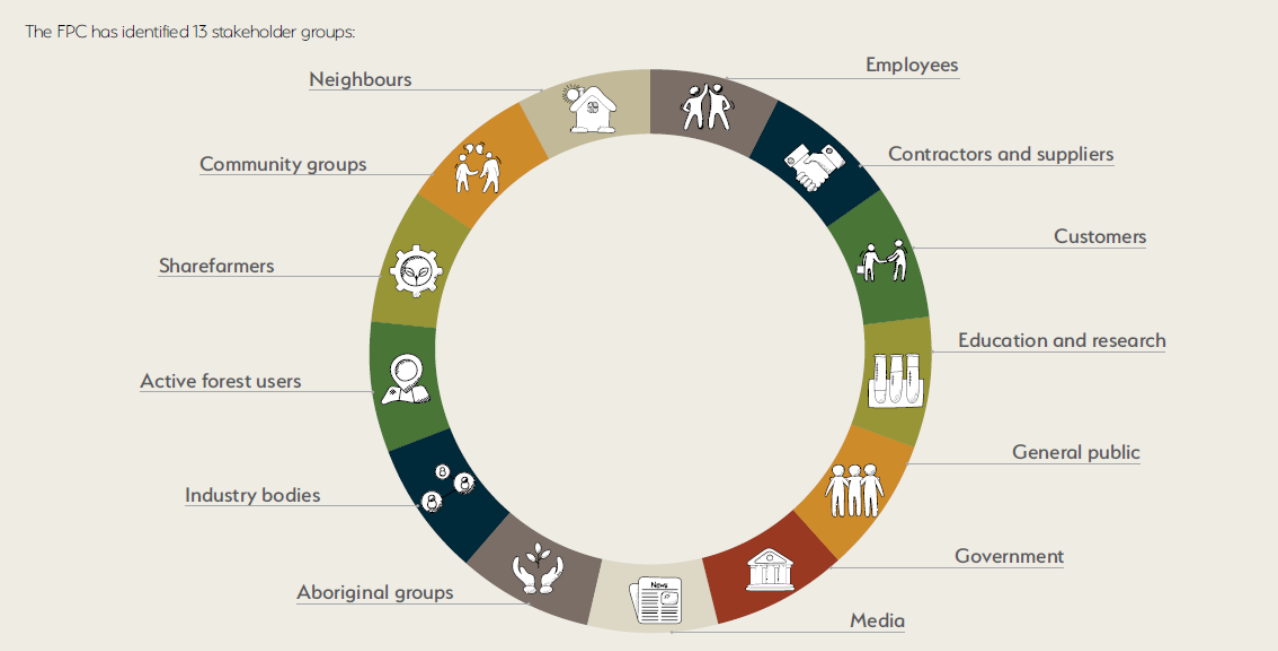

Figure 19- Stakeholder groups identified by the FPC

The FPC is committed to building and maintaining strong and effective relationships through purposeful, practical and meaningful engagement. The FPC Stakeholder Engagement Strategy is a framework that defines goals and commitments as well as processes and a planning approach for specific stakeholder engagement activities. It guides the FPC through a process to understand the views, needs and expectations of its stakeholders to help achieve strategic and operational objectives.

Our engagement planning and implementation focuses on a flexible and adaptable approach to accommodate different community and stakeholder needs. This allows for targeted and meaningful engagement via a range of community and stakeholder engagement activities and broader stakeholder or community education programs.

Plantations contribute to the diversity and value of local communities, providing unique opportunities for partnership, regional employment and community involvement. Factual information is key as there can be misunderstanding and misconceptions about plantations and FPC's Softwood Plantation Investment Program. The FPC is committed to listening to and working with local communities and our plantation neighbours to ensure ongoing and positive relationships.

Sharing information about the Softwood Plantation Investment Program and existing plantation estate management is important to ensure community awareness and understanding about this vital industry.

Local governments are a key stakeholder group, both before, during and after land acquisition. FPC representatives liaise directly with local government representatives, landowners, neighbours and other

stakeholders to answer questions and provide any information they require in relation to our plans and operations.

The Forestry Minister and FPC representatives meet with industry groups to discuss issues and the details of the investment. In addition, the FPC also attends relevant local community events to educate and inform people about plantation forestry, the lifecycle of pine and the Softwood Plantation Investment Program.

The FPC welcomes feedback that can help us improve our practices and performance. For further information, including the FPC's Complaints handling system, see our webpage. Provide feedback to the Forest Products Commission.

Aboriginal Engagement

The FPC is committed to developing and strengthening relationships with Aboriginal and Torres Strait Islander peoples, engaging staff and stakeholders in reconciliation through our business activities. Staff participate in cultural awareness training and support other reconciliation and engagement initiatives.

The FPC is a signatory to Noongar Standard Heritage Agreement along with the Noongar Regional Corporations in the South West of Western Australia. Aboriginal heritage and cultural assessments are embedded in FPC operations.

Improvements that help Aboriginal businesses to become commercially sustainable are a priority for the FPC, particularly in regional areas of Western Australia.

Initiatives include:

- Continued success in the implementation and management of the Sandalwood Dreaming program, which supports Aboriginal businesses to work on country harvesting sandalwood.
- Continued support for training and financial management, particularly as new contractors commence work.
- Continuing to award contracts to Aboriginal businesses, with 12.5% of new FPC contracts entered in this reporting period being for Aboriginal businesses.

Supporting staff to improve their awareness and understanding of Aboriginal culture is also an important step in enhancing our Aboriginal engagement activities. Cultural learning and national celebrations provide a platform to raise awareness about issues of relevance. Using art as a way to share culture is also having a great impact. Following an Aboriginal Art Competition linked to forestry, the FPC purchased artworks for an FPC art collection. A new staff uniform polo shirt that features the Aboriginal artwork from FPC staff choice award was also developed (See Figure 1).

Social and economic impacts

Employment

The FPC employs 185 people across our work sites with 64 per cent of our staff located in regional towns. This includes permanent full time and permanent part time employees, fixed term contract, casual employees and trainees.

As part of our commitment to the health and wellbeing of staff and enabling their success, through our People Plan 2024-2026 we continue to deliver a wide range of programs and initiatives to foster a positive culture, promote health and wellbeing and a safe workplace.

Investing in our people is a key priority. Through training and development, a range of people strategies and diversity and inclusion initiatives we strive to build workforce capability and an optimal workplace culture which supports us to achieve our People Vision: Engage Our People; Grow Our People; Futureproof Our Workforce: Right Skills, Right Staff.

The FPC recognises the importance of building succession strategies and our talent pipeline with the development of its Graduate Program over recent years. This program supports succession and future skills requirements ensuring our workforce is future fit. Our graduate officers undertake structured training and development activities alongside coaching and mentoring from experienced forestry professionals. Rotational opportunities include forest management activities, silviculture, bushfire protection and remediation.

The broader softwood industry supports approximately 1,900 full time equivalent jobs in 2019/2020 (Angelakis and Magnusson, 2022) with many of these in rural WA.

Safety

Safety is key priority for the FPC and is at the forefront of decision making. The FPC works closely with industry stakeholders to ensure a strong focus on safety as well as training and development to support the adoption of new technologies and systems.

The FPC engages with the Forest Industry Federation of Western Australia (FIFWA), the Australian Forest Products Association (AFPA), and the Community and Public Sector Union/Civil Service Association to improve Work Health and Safety (WHS) across the forest industry.

The FPC is a member of the AFPA WHS sub-committee. Its Safety, Health and Wellbeing Strategy 2022-2025 and Annual Works Plan includes the development of industry guidance documents and delivery of projects and research that focus on the use of technology to reduce risks and incidents.

The FPC has collaborated with the WA forest industry to develop a new WA Forestry Code of Practice aligned with WA WHS legislation and modelled on Safe Work Australia Codes of Practice.

Community

The FPC is committed to supporting the communities where many of our employees and contractors live and work. In particular, the FPC is committed to assisting with fire management and control through the Community Fire Protection Grants program (see Fire Management and Protection).

Attending community events in our plantation investment priority areas is a useful conduit to share information about the program with regional stakeholders. Our presence allows us to demonstrate our local contribution and raise awareness of the value of plantations, especially in the South West which is home to most of the people employed in WA's softwood timber industry.

These events also raise awareness about the lifecycle of pine from seed to timber and highlight our commitment to fire management, carbon capture and timber production. Forest Learning virtual reality (VR) headsets have provided a new and innovative way to teach children and adults about sustainable forestry through interactive and educational videos.

The FPC continues to support the integration of pine plantings on private land through the Farm Forestry Assist program. Under this program eligible landowners can receive pine seedlings from the FPC's nursery to establish a plantation on their land. As part of this program the FPC provides technical advice to the landowner as well as connection to plantation establishment contractors.

Recreation

Pine plantations offer recreation opportunities for the community, including bike riding and hiking. Events such as the SEVEN mountain bike race utilise the road network though FPC plantations.

The FPC liaises with DBCA, Local Governments and other stakeholder groups on mixed use recreation activities in and through our plantation estate.

Figure 20 - Recreational bike riders on a road through an FPC pine plantation.

Plan implementation and management

Management under this plan is monitored and continually improved under the FPC's Integrated Forest Management System (IFMS). The IFMS drives continuous improvement under a Plan-Do-Check-Act model and is described in the FPC's *Procedure 83 – Integrated Forest Management System*.

Incident management is an important part of the FPC's IFMS, and the FPC has robust incident management procedures and practices in place. The FPC's procedures provide guidance for reporting incidents, identifying and addressing the root cause and managing the process through to closure. Incident data is periodically analysed for trends, incident recurrence and to determine the effectiveness of prescribed actions.

Performance monitoring and auditing are an integral part of the IFMS. FPC operations are regularly internally and externally audited. The FPC routinely reports on its operational performance.

The FPC's IFMS is reviewed regularly at both Operational and Executive level to assess and continuously improve the effectiveness of the system.

In addition, the FPC is independently audited to the Australian/ New Zealand Standard for Sustainable Forest Management (AS/NZS 4708:2021) under the Responsible Wood scheme.

Conclusion

Timber from well managed forests and plantations is an environmentally sustainable building material. It is renewable, naturally beautiful, versatile and helps to tackle climate change by storing carbon.

The trees grown in the FPC's softwood plantations supply local businesses with a variety of timber products. The timber is used to produce sustainable structural building products for the construction of many Western Australian homes and products commonly used in the farming and horticulture industry. The FPC aims to ensure a continual supply of timber for our local industry as well as protecting Western Australia's natural resources.

For feedback on this management plan, please contact certification@fpc.wa.gov.au. For more general enquiries, please contact info@fpc.wa.gov.au or phone (08) 9363 4600.

Figure 21- Pine is a key commodity in Western Australia's construction industry

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Shortened Terms

AFPA – Australian Forest Products Association

AS/NZS 4708 – Australian and New Zealand Standard for Sustainable Forest Management

APVMA - Australian Pesticides and Veterinary Medicines Authority

CoC – Chain of Custody

CoR – Chain of Responsibility

DAS – Disturbance Approval System

DBCA – Department of Biodiversity and Conservation

DFA – Defined Forest Area

DFES – Department of Fire and Emergency Services

DPIRD - Department of Primary Industries and Regional Development

DWER - Department of Water and Environmental Regulation

EDN – Electronic Delivery Note

EPA – Environmental Protection Authority

ERI - Early Rotation Inventory

ESFM – Ecologically Sustainable Forest Management

FIFWA - Forest Industry Federation of Western Australia

FPC – Forest Products Commission

FMP – Forest Management Plan

FWPA - Forest & Wood Products Australia

GPS – Global Positioning System

GRAC - Grower Research Advisory Committee

IFMS – Integrated Forest Management System

KPI – Key Performance Indicator

LIDAR - Light Detection and Ranging

LVL – Laminated Veneer Lumber

NCC - Nano Crystalline Cellulouse

NDVI - Near Difference Vegetation Index

NGIWA - Nursery and Garden Industry of Western Australia

NSHA - Noongar Standard Heritage Agreement

PDWSA - Public Drinking Water Source Areas

PSP - Permanent Sample Plot

PTI - Post Thinning Inventory

SCI – Statement of Corporate Intent

SWALSC – South West Aboriginal Land and Sea Council

TBA – Tree Breeding Australia

WA – Western Australia