WAPRES PLAN 01

PLANTATION MANAGEMENT PLAN

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1. WAPRES PLANTATION ESTATE

WAPRES manages *Eucalyptus* plantations throughout the South-West region of Western Australia with trees grown primarily for pulpwood. WAPRES aims to meet or exceed industry best practice in all our operations. Our forest management practices are certified to the Responsible Wood (RW and internationally recognized through PEFC) Sustainable Forest Management and Forest Stewardship Council® (FSC®) Forest Management. WAPRES also implements a dually certified RW and FSC® Chain of Custody system to ensure the accountability of our wood fibre products.

WAPRES, through its owner Marubeni Corporation of Japan, provides commitment not to offer or receive bribes in money or any other form of corruption, and will comply with anti-corruption legislation domestically and internationally. The Marubeni Group Compliance Statement exhorts:

“When you are faced with a choice between integrity and profit, choose integrity without hesitation.”

WAPRES adheres to the plan outlined below to ensure that its Plantation Management Policy (Policy 02) is implemented. Where applicable this Plantation Management Plan is consistent with the FIFWA “Code of Practice for Timber Plantations in Western Australia”. This plan is reviewed regularly to consider changes in management objectives, the results of measurements and monitoring and any other new information.

WAPRES’ Defined Forest Area (or Forest Management Unit), covers a total area of approximately 21,132 hectares in the south west of Western Australia. This area comprises both freehold properties owned by WAPRES, private property plantations managed by WAPRES as well as the gross area covered by all of our more than 170 leases. WAPRES currently manages approximately 16,904 net stocked hectares of mostly Tasmanian Blue Gum (*Eucalyptus globulus*) plantations within this Defined Forest Area. The plantations are generally within the 700mm rainfall isohyet and are situated south west of a line between Boddington in the north and Albany in the south.

The total estate under management is located on about 158 separate properties, resulting in an average size of 133 -hectares, varying from as little as 11 hectares up to 769 hectares.

Currently, the sole commercial product grown in the plantations owned and managed by WAPRES is pulpwood, used in the manufacture of printing and writing paper. Until recently the woodchips had exclusively been sent to our shareholder’s customers in Japan, but China has now become an important market and new markets are also being investigated in other countries including India. WAPRES has a history of investigating alternative uses for the wood and where possible will continue to contribute to industry based research initiatives in this area.

As stated in our Plantation Management Policy, WAPRES seeks to maximize the ability of its own estate to balance wood flows from other sources. The objective is to provide our customers with a constant, reliable supply of high-quality *E. globulus* woodchips for their pulp and paper making businesses from our Bunbury port facility. We achieve this through the judicious use of silvicultural treatments such as fertiliser application and by managing rotation lengths within the flexibility provided by our land leasing arrangements.
2. SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS OF PLANTATION OPERATIONS.

The Social and Economic Landscape

The South West of WA is a major contributor to the WA economy ($15 billion during 2011-12) and has been growing steadily in recent years. The population is also growing at 2.8% per year, totalling 165,000 residents in 2012. The major industries by region are described below:

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<tr>
<th>Region</th>
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<tr>
<td>Bunbury Wellington Region</td>
<td>Mining</td>
<td>Warren Blackwood Region</td>
<td>Agriculture</td>
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<td></td>
<td>Infrastructure</td>
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<td>Commercial &amp; professional services</td>
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<td>Professional services</td>
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(Source: [www.swdc.wa.gov.au](http://www.swdc.wa.gov.au))

Plantation forestry is currently a significant land use, totalling 287,000ha of hardwood plantation in 2014 (Gavran, 2015). It is still a fairly new industry, with the most significant establishment period occurring between 1996-2000 (Gavran and Parsons, 2011). Recent figures indicate that growth has stabilised and area is now slightly decreasing (Gavran, 2015; Gavran and Parsons, 2011).

Prior to purchase or lease for plantation establishment, WAPRES properties were used for a range of agricultural purposes. This includes pasture for sheep (wool and meat), beef cattle, dairying, cropping, viticulture, horticulture or plantations. WAPRES does not establish plantations or purchase wood from any plantations converted from native forest after 1994.

For a detailed report on socio-economic impacts of the forest industry in Western Australia see Schirmer et al (2017).

2.1. Leaseholder Survey

A survey of WAPRES leaseholders was conducted by WAPRES in 2006, with 50 respondents from 272 leaseholders. Overall results were positive with 74% of respondents inclined to re-lease their land to WAPRES. The main reasons stated for leasing land to WAPRES were financial and lifestyle benefits.

Annual Tree Farmer Evenings are held at Bunbury and Manjimup to inform lease holders of the current market and progress of the company. This provides an opportunity for current lease holders to engage with WAPRES staff in any areas of concerns or improvements they may consider to be of relevance.

2.2. Positive Social and Economic Impacts

*Contribution to local economies.* WAPRES has both a “buy local” and “employ local” philosophy, with our operations contributing approximately $60 million annually to South Western WA economies. Since 2001, the growth of the plantation industry has provided a degree of transition of
employment from the declining native timber industry. Local employment was rated as the highest positive impact from forestry by Schirmer et al (2017).

**Diversity in the economic landscape.** Plantation forestry offers an alternative land use option for landowners. A greater variety of industries in a region gives resilience to local economies.

**Lifestyle and financial benefits to leaseholders.** A significant proportion of WAPRES leaseholders report financial and lifestyle benefits as a reason for converting their farmland to plantation.

**Community and industry collaboration.** WAPRES has a community sponsorship program and assists in a number of community projects, scientific research and events annually. WAPRES participates in regional forums, including Bunbury Wellington Economic Alliance (BWEA). This alliance involves a broader Industry membership (mining, forestry, construction, education & training) and the local council Presidents in discussions on economic development, industry activity and regional issues. WAPRES is an active member of the Forest Industry Federation of WA (FIFWA) and the Forestry Training Association.

**Industry research.** Companies operating throughout a region are in a position to identify and learn from trends and contribute to knowledge accumulation. WAPRES contributes to and is involved with collaborative industry R & D initiatives, and groups such as the Industry Pest Management Group and the Southern Tree Breeding Association.

**Improvement of roads.** Upgrading of roads to facilitate harvesting operations can be a positive for local residents.

### 2.3. Negative Social and Economic Impacts

**Traffic and quality of local roads.** Schirmer et al (2017) reports the highest community concerns regarding the forestry industry were negative impacts on traffic and road quality. WAPRES consults with local shires and Main Roads WA regarding haul routes and any conditions on certain roads. WAPRES was the initiator of the system of school bus time curfews in 2001, which has now become an industry standard. All WAPRES haulage contractors are required to maintain vehicles to statutory safety standards and are subject to company and regulatory inspections.

**Impacts on attractiveness of local landscape.** Schirmer et al (2017) also found that the community rated negatively the visual impact of forestry. The harvesting of trees and the associated site cleanup are necessary and temporary stages in the cycle of a plantation and it is within business interest to complete these processes in a timely manner as conditions allow.

**Increased fire risk.** It is acknowledged that plantations may increase fire risk, particularly with practices such as retaining slash on site. WAPRES has developed a Fire Management Plan and invests in a number of fire mitigation strategies, including maintaining a fire response team and a 24hr Fire Line, liaising with local fire brigades and government agencies, maintaining firebreaks and ensuring fire control units are on site during harvest operations. WAPRES fire control practices are frequently associated with positive interactions within the community.

**Increased water use.** See Altered Hydrology under Environmental Impacts.

**Increased pests and weeds.** Some community members point to plantations as sources of weeds and pests. WAPRES plantations are inspected at least twice yearly for weeds and develop necessary
actions to manage infestations. WAPRES liaises with local weed action and pest control groups and also addresses individual concerns when raised.

Decline in populations, employment, local memberships. Some communities have concerns that the plantation industry results in removing people from the land. Studies (Schirmer et al., 2008) have found that selling land to the plantation industry as opposed to leasing has greater community impacts. WAPRES primarily leases land, with landowners or tenants in many cases remaining on the property.

Noise and disruption associated with harvest activities. WAPRES provides residents and neighbours with information including operation timing, a map of the proposed harvest area, haul roads and relevant contact details. Night operations are restricted to areas where disruption to any neighbours is minimised. Infrastructure is inspected and any damage is rectified prior to leaving the property. To minimise disruption associated with our operations, measures such as reducing speed limits, dust suppression, restricting haulage to certain times or finding an alternate route are undertaken.

Encumbrance of future land use. Some landowners are concerned as to how plantations will limit future land use. WAPRES consults with landowners how their land will be left upon a lease exit and provides advice.

Chemical Use. See under Environmental Impacts.

2.4. Environmental Landscape

WAPRES operates within the Southwest Australia Ecoregion. This zone is globally significant in terms of biodiversity and ecological value and extends from Shark Bay in the north to Esperance in the south. One of the few Mediterranean biomes in the world, its diverse landscape encompasses kwongan heathlands, eucalypt woodlands, mallee, tall eucalypt forests, swamps, naturally saline wetlands and granitic outcrops (Gole, 2006).

The ecoregion is listed as one of 34 Global Biodiversity Hotspots - an area of exceptional biodiversity confronting considerable environmental pressure (Conservation International, 2007).

See WAPRES PLAN05 - HCV Management Plan for a more detailed description of biodiversity values in the region.

2.5. Positive Environmental Impacts

Plantations in general require less input of energy and resources, resulting in less disturbance, than traditional farming methods. This can result in positive environmental outcomes.

Certified Operations. As a company certified to environmental and forestry management schemes, WAPRES adheres and is audited to a number of standards that require responsible land management across its estate.

Livestock removal or reduction. The removal or reduction of livestock on previously grazed land reduces environmental pressure on the landscape.
Improved water quality and biodiversity. Again, stock removal and less intensive land use benefits water quality and biodiversity. Stewart (2011) demonstrated that water quality, biodiversity and riparian condition of streams running through plantation in the south west was improved in comparison to pastured land.

Reduced salinity. Plantations have been used successfully as a tool to reduce salinity throughout the Collie and Kent River catchments (Bari et al 2004, Mauger et al 2001).

Protection of remnants and creeklines. It is standard practice in WAPRES operations for native vegetation and riparian areas to be protected and classified as operational exclusion zones.

Soil resources. Plantations are likely to improve soil resources as compared to running stock. Mounds and rip lines are constructed along contours, helping to catch water in the landscape and reduce runoff and erosion. Mechanical soil disturbance only occurs in planting preparation and harvesting (approximately on a 10 year cycle). Leaf fall and slash accumulate during the growing period and can increase soil organic matter.

Reduced “edge effects” and improved connectivity of remnants. Plantations offer cover to wildlife and can facilitate the movement of fauna and flora between stands of remnant vegetation and bushland.

2.6. Negative Environmental Impacts

Chemical use. There may be community concern regarding the use of chemicals in plantations. WAPRES operates a number of controls (certified to EMS, RW and FSC® standards) to eliminate or minimise impacts arising from chemical use. These include monitoring methods to determine if chemicals are required, selecting safer chemicals, operating to a spray prescription, and using only licensed contractors. Sensitive areas and High Conservation Values are marked on maps and are considered in the spray prescription. Aerial application of chemicals is only considered when it is very unlikely that non-target sites will be impacted, and residents and neighbours are contacted prior to any aerial operations.

See WAPRES Statement 08 - Chemical Usage Statement for more information.

Spread of Phytophthora dieback. Activities such as road building and vehicle movement may spread the water borne Phytophthora dieback pathogen, a serious threat to biodiversity in South West WA which is present throughout most disturbed areas. WAPRES liaises with DPaW when haulage may be required through dieback free Disease Risk Areas (DRAs).

Increased pests and weeds. See under Social Impacts.

Altered hydrology. There is a community concern that trees utilise more water in the landscape than shallow rooted pasture or crops. Studies have indicated reafforestation needs to cover at least 15-20% of cleared catchment land area to begin to have a measurable impact on catchment flows (Parsons et al 2007). Plantations in south west WA (including pines) cover on average 5.7% of cleared catchment areas, and are generally scattered and of varying ages.

Burning practices. In some instances WAPRES burns harvest slash in order to improve access for re-establishment, future land use, or to reduce fire risk. There is some concern that this may negatively impact on soil health. As this practice may only occur once in ten years at most, WAPRES does not believe this would be major contributor to soil decline.
Erosion and turbidity from poorly maintained drainage. WAPRES inspects plantations at a minimum of twice a year, and at-risk plantations after significant storm events. Issues are noted and rectified as required.

Impacts on water quality and biodiversity from harvest operations. WAPRES harvest management practices are considered to reduce or eliminate impact on waterways. A recent study has demonstrated that bluegum harvesting operations in the Albany area had no detrimental effect on water quality or biodiversity. These studies also verified that water quality and biodiversity was improved as it ran through plantation property.

Soil disturbance from heavy machinery. Roads are assessed prior to harvest and upgraded as required. Harvesting operations are scheduled to avoid potentially wet areas in winter, and may be suspended during adverse weather conditions. Machines are required to only use approved stream crossings and avoid exclusion zones. Log landings and processing sites are established in nominated sites. Significant soil disturbance is raised as an WAPRES F2.0 - Incident Note, with further operations assessed for suitability.

Accidental release of hydrocarbons. Contractors and employees are required to follow WAPRES procedures regarding prevention and management of oil spills. Refuelling is to occur on mineral earth only and away from watercourses. Significant spills are reported as an WAPRES F2.0 - Incident Note.

Wildings. Bluegums managed as pulpwood are regarded as non-invasive in South West WA, however wildings do sometimes occur outside of plantation areas. If plantation inspections detect wildings, appropriate control measures are undertaken.

See WAPRES 06 - WAPRES Environmental Management Plan, WAPRES 9050 - The Protection and Management of Biological Diversity and WAPRES 9060 - The Protection of Soil and Water Resources in Plantations for further details on how WAPRES protects environmental values.

3. STAKEHOLDER CONSULTATION.

WAPRES is committed to meaningful stakeholder consultation with its customers, lessors, neighbours, local governments, and key state government departments, general interest groups, cultural and heritage groups and the community generally.

WAPRES maintains a list of community and environment stakeholders who are notified of upcoming audits and receive our Blueprint newsletter. Any member of the public can register to be included on this list through the WAPRES website.

The document P18 - Stakeholder Engagement describes the engagement process in more detail. WAPRES has formalised its commitment to its neighbours, local communities and key stakeholders with the development of its P06 - Good Neighbour Statement.
4. PRINCIPLES OF ENVIRONMENTAL CARE.

WAPRES is committed to carrying out its plantation management and harvesting and haulage operations in accordance the Code of Practice for Timber Plantations in Western Australia and its Principles of Environmental Care, these documents include:

- WAPRES 9010 - Environmental Monitoring Guidelines
- WAPRES 9020 - Chemical and Hydrocarbon Incident Management Guidelines
- WAPRES 9040 - Hygiene Control in Plantations
- WAPRES 9050 - The Protection and Management of Biological Diversity
- WAPRES 9060 - The Protection of Soil and Water Resources in Plantations

5. MANAGEMENT OF REMNANT NATIVE VEGETATION.

The south west of Western Australia is globally significant Biodiversity Hotspot, supporting a unique and rich biota. WAPRES acknowledges responsibility to manage native vegetation within our land estate with the objectives to conserve the existing biodiversity and enhance these values where feasible.

WAPRES recognises that the establishment and maintenance of plantations on farmland generally has a positive effect on both biodiversity and water quality (Grimbacher, 2011). Reduced grazing pressures, ground disturbance, and increased vegetation cover as compared with pasture or horticulture contribute to this outcome. Plantations adjacent to native vegetation also decrease “edge effects” and offer increased connectivity between native remnants.

WAPRES has a total of 3500 hectares of “conservation area” within its DFA/FMU (14% of 26,000 ha) as of December 2017. Conservation area comprises remnant vegetation, streams and buffer zones, and unplanted pasture areas. On leased properties, while the native forest is technically within the area covered by the lease (annexure) the payment of rent is calculated on the net stocked area of plantation (productive capacity), which is only established on previously cleared areas. As a result WAPRES generally does not carry out any active management activities on these areas of native forest, without detailed consultation with the landowner. The type of activity we would carry out in these native forest areas is very limited and excludes any harvesting of the native forest. Typical management activities in these areas would include assisting landowners with fuel reduction burning and the upgrading of existing roads through these areas (e.g. gravelling and installation of drainage) to cater for plantation harvesting activities. Fuel reduction burning also has the ancillary benefit of assisting in forest regeneration and maintaining biodiversity.

Our primary management tool for the conservation of native remnants is exclusion from our operational activities. Remnant vegetation and other conservation areas are listed as Operational Exclusion Zones, and breaches of this rule are recorded as WAPRES F2.0 - Incident Note and dealt with accordingly. Streams and wetlands have a minimum operational buffer as defined elsewhere in our Management System. Noxious weeds, including those in remnants and stream reserves, are identified during plantation inspections and controlled as appropriate. The ecological value of dead and fallen timber to biodiversity and ecosystem function is recognised, and this is not removed unless it poses an immediate safety risk.
WAPRES is not involved in the harvest of any species listed by CITES (the Convention on International Trade in Endangered Species of Wild Flora and Fauna).

WAPRES is a supporter of the Department of Biodiversity, Conservation and Attractions (DBCA) Land for Wildlife (LFW) program with two freehold properties (Lake Jasper and Matthews, with significant areas of native forest registered under the program. The scheme provides us with a detailed report on each property including a habitat description, flora and fauna notes, connectivity of the native forest on the property to other habitats and information on the use of fire management. Practical information on how to control weed infestations and feral animal populations is an important part of these reports. WAPRES has developed its own management plan for native vegetation on Matthews plantation.

6. HIGH CONSERVATION VALUES.

High Conservation Value (HCV) areas are those that may possess important values such as threatened species, ecological communities or cultural heritage. WAPRES has identified a number of areas under its control that fit the criteria for High Conservation Value. Several remnant vegetation areas are high quality remnants of significant size that potentially provide habitat for threatened animals such as the quenda, woylie, quokka and chuditch, as well as being representative of the local ecosystems. WAPRES will consult with the owners of the leasehold properties where HCV values have been identified to explain the significance of these findings and will provide these landowners with a copy of the “Special Values Booklet” produced by the WA plantation industry. We will also provide them with contacts to local community groups and government agencies if they require further information or assistance. A cultural site (an Aboriginal burial ground) has also been identified near a WAPRES managed plantation.

Threats to these values are identified, and appropriate monitoring and management plans are developed in consultation with expert stakeholders.

More detail is available in WAPRES PLAN 05 - High Conservation Value Management Plan and the Plantation Industry Special Values Booklet.
7. SILVICULTURAL SYSTEMS.

WAPRES generally employs a simple silvicultural system for its plantations. The plantations have a nominal harvest age of 10 years and the plantations are clear-felled, without any thinning operations. However, there is flexibility to vary the age at which clear-felling is carried out, with or without an earlier thinning operation being conducted. This enables us to manage the plantations according to their specific site conditions (especially soil depth and rainfall) as well as enabling us to maximize the use of our plantations to smooth wood flows from other sources within the constraints of our lease agreements. This would not be possible with inflexible clear-fell dates and without the option of thinning.

7.1. Expected Harvest Volumes

WAPRES maintains a regular inventory program that enables us to predict future volumes of logs that will be produced both from the plantations we own and also from the large plantation estate we manage for third parties. The plantations have historically been measured at both age 4.5 and 7.5 year, and the standing volumes estimated from these inventories are grown on to a nominal age 10 harvest, using growth models developed from our comprehensive set of Permanent Sample Plots (PSP). Over the last couple of years the inventory program has been modified slightly more effectively meet company requirements. One of the efficiency changes has been the reduction in the number of heights measured during an inventory, after some analysis of previous data it was demonstrated that reducing the number of heights would only increase the error in heights marginally (below 10%). In addition, the re-location of a portion of old inventory plots and subsequent re-measuring has enabled an opportunity for better analysis and interpretation of the inventory data by eliminating any difference in sample error.

There are currently three growth models for planted stands; one is for the highest quality sites (deep soils and >950mm rainfall) which account for about 15% of our planted estate whilst another is used on our lowest quality sites (<650mm rainfall) which account for about 10% of our planted estate. A third model is used for the majority of our planted estate which falls between the 650mm and 950mm rainfall zones or on shallow soils in the >950mm rainfall zone. Use of the growth models, which historically have provided very accurate results, has become very problematic over the last couple of years due to the rapid increase in insect damage since about 2008. As a result, plantations measured in the 2013/14 inventory were grown on to age 10 according to their Estimated Standing Volume (ESV) that were measured at the time of inventory. Three ranges of ESV for the 4.5 and 7.5 year inventory were developed, each range would then apply one of the three models depending on their individual plantation ESV. Use of the growth models going forward will depend on what happens to the levels of insect attack but forecasting future yields is expected to remain difficult for at least the next few years. At this stage we do not have enough data to develop a coppice growth model. In the meantime, for coppice stands we have assumed that the CAI between age 7.5 and harvest is the same as between age 4.5 and 7.5.

WAPRES’ own plantations in the Bunbury export zone are expected to yield between about 200,000 and 400,000 tonnes of wood fibre per annum over the next 5 years (2016-2020 inclusive) based on an average 10-year rotation length. WAPRES also has access to client and third-party wood through wood purchase agreements, which will yield between about 200,000 and 400,000 tonnes of logs per annum over the same period. Additional private resource is available for purchase, which will ensure that we are able to continue to meet our customers’ requirements for the foreseeable future. Average total resource availability in the Bunbury export zone over the next 5 years that could be secured by WAPRES is estimated to be about 650,000 tonnes per annum. Sales volumes in this period are likely to average between 600,000 and 700,000 tonnes per annum.
7.2. Site Selection and Productivity Determination

All new plantation sites must receive at least 700 mm/annum of rainfall.

All new plantation sites must be either be ex-pastured or ex-plantation. WAPRES will not convert native forest to plantation. There may be limited circumstances where small scale clearing including for infrastructure may be required, but only as approved by the appropriate authorities. We will strive to ensure that no threatened species or habitat, or significant ecosystems are adversely affected.

WAPRES identifies High Conservation Values (HCV) across its estate through initial desk-based assessments, followed through with field reconnaissance of higher-risk plantations. HCV areas are assessed for potential threats and appropriate management strategies are developed.

WAPRES' preferred method of land acquisition is leasing; however selective land purchases may be required to ensure minimum requirements for resource security are met. Land may be purchased by WAPRES directly or by other parties looking to invest in plantations.

All new plantation sites have a soil assessment carried out, as identified in the Land Acquisitions and Estate Operations Manual. Productivity for first rotation sites will be determined using actual harvest information for similar sites where possible. Where this is not available the empirical model SITEPROD developed in conjunction with the CRC-SPF will be used. For second rotations (2R) a new productivity matrix has been developed based on the evidence gained from recent inventories that second rotation yields will in many cases be less than the first rotation. However as noted above in the inventory section all yield forecasting in the Bunbury Export Region will remain problematic at least until the recent rapid increase in insect damage stabilises or is reversed.

7.3. Plantation Approval Process

7.3.1. The Internal Rate of Return (IRR) for all new plantations will be assessed on the relevant Plantation Proposal Form and in accordance with the latest version of the Land Evaluation System.

7.3.2. All Plantation Proposal Forms meeting minimum IRR requirements will be forwarded to the Managing Director for approval. Plantations that fail to meet the minimum requirement but have additional values such as scale or location, may also be forwarded along with an explanation of the additional values. The Managing Director may approve these if the case is sufficiently compelling.

7.3.3. Second rotation viability will be assessed having regard to the alternative cost of lease exit where this is relevant.

7.3.4. It is the responsibility of the Resource Manager to ensure all necessary local government approvals are obtained and the lease registered with the Titles Office at Landgate, and if required, the approval of the WA Planning Commission.

7.4. Choice of Species
WAPRES initially chose Tasmanian Blue Gum (*Eucalyptus globulus*) as the preferred species for its plantation program, which commenced in 1980. This decision was based on results of trials conducted by the then W.A. Forests Department and from observations of plantations in other parts of the world with similar Mediterranean climates to ours. The main criteria used for this initial selection were:

- growth rates (over a range of soil types),
- pulp and paper making properties,
- resistance to dieback (*Phytophthora*); and
- the ability to coppice (reshoot from the stump).

Since then WAPRES has conducted a number of species trials, and these have confirmed the superiority of *E. globulus* to grow best over a wide range of soils. Some of the trials have included the major native species including karri (*E. diversicolor*) and marri (*Corymbia calophylla*) and in these cases the native species have always performed very poorly. Over the last twenty years the Japanese pulp and paper makers have also made it clear the *E. globulus* is by far their preferred hardwood species due to its high pulp yield, good basic density, good paper making qualities and low chemical requirement (for both pulping and bleaching). Another advantage of *E. globulus* is that it has proved to be non-invasive in Western Australia, particularly when managed as a short rotation pulpwood crop. Despite this we continue to closely monitor our plantations to ensure any spontaneous regeneration is managed outside of plantation areas. Up until 2007 all of our operational plantings were of *E. globulus*.

Based on the results of some of the species trials referred to above Gully Gum (*E. smithii*) emerged as a viable alternative in 2005, particularly on sites with shallow soils where *E. globulus* is not well suited. Following testing of the pulping properties of the wood and confirmation from our major customer that they were very happy with the wood properties, the first operational scale plantings of *E. smithii* occurred in 2007, with a total of about 350 hectares established. Between 2007 and 2011 a total of about 900 hectares of *E. smithii* had been established on about 40 individual plantations. It was mostly planted on sites with soil depths of between about 2.0 and 3.0 metres. Above a depth of 3.0 metres it appears that *E. globulus* will outperform *E. smithii* in most circumstances, even at stockings as low as 600-700 stems per hectare. While our experience with *E. smithii* is not as long as our experience with *E. globulus*, the original trials date back to 1989 and the original trees are still present. Despite this no spontaneous regeneration has been observed and we are therefore confident that *E. smithii* will also prove to be non-invasive. Again, we continue to closely monitor all of our plantations to ensure spontaneous regeneration does not occur.

Unfortunately, the *E. smithii* plantings have in many cases been severely damaged by the rapid increase in the population of the new species of eucalypt weevil (*Gonipterus sp*) and the planting program has been put on hold. Where insect damage has been minimal growth has been very impressive and the species still has a lot of promise once the insect problem is resolved.

### 7.5. Maintaining Productivity

The major challenge facing blue gum management in the south west of Western Australia is arresting the declines in productivity that have emerged over the last 5-10 years. Productivity declines were first formally recognised in second rotation planted stands in 2008. Shortly afterwards they were also recognised in coppice stands and then more recently in first rotation stands such as Magenta and Karafilis. Because productivity decline was first observed in second rotations it was initially referred to as 2R decline ("Short 2R’s"). However a detailed study of 1R and 2R growth in planted stands by CSIRO scientists (White *et al* 2013) using WAPRES PSP’s revealed that very little of the observed decline...
was caused by soil water drawdown by the 1R as had been assumed. Instead the decline was largely
(40%) attributed to a decline in seasonal conditions (reduced rainfall, higher temperatures and
increased evaporation) and even more so (50%) to a factor that could not be explained by their
modelling which they attributed to greatly increased insect damage. In coppice stands we also believe
that sub-optimal management practices particularly excessive stocking reduction have contributed to
the observed productivity declines in these stands.

Since the 1970’s rainfall in the south west of W.A. has decreased by 10-15%. This abrupt change has
largely resulted from a reduction in autumn and early winter rainfall, with little change in late winter
and spring rainfall and a slight increase in summer rainfall. Most climate change models suggest that
a further reduction in rainfall of a similar scale is possible over the next 20-30 years. At the same time
there has also been an increase in temperatures and a corresponding increase in evaporation which
is exacerbating the decline in rainfall. There is anecdotal evidence that decreases in bluegum
productivity have already occurred and further decreases are possible over the next 20-30 years. With
this in mind, management practices such as reduced stocking rates, targeted fertilising to maximise
water use efficiency and use of more water efficient species or genotypes and fallow periods will all
become increasingly important. A very large trial established on our Perup Treefarm in 2010 is looking
at the interaction of fallow periods with stocking rate, nutrition and species (blue gum and smithii) on
the productivity and profitability of a second rotation replanted stand. The trial has subsequently
received financial support from the CRC for Forestry allowing for the installation of neutron moisture
monitoring bores to measure water recharge under the various treatments.

Since about 2008 the level of insect damage in blue gum plantations in W.A., particularly in the
Bunbury Export Zone where the overwhelming majority of our plantations are located, has increased
markedly. The increase in damage has been attributed to the introduction of a new species of Eucalypt
weevil (Gonipterus sp.) which was first observed in W.A. near Donnybrook in about 2005. Populations
of the new weevil increased rapidly and the damage has spread quickly and increased markedly in its
severity over the last 6-8 years, although damage levels in late 2013 and early 2014 appear to have
suddenly lessened significantly. The exact reasons for the emergence and rapid spread of this pest are
not clearly understood nor are the reasons for the recent marked reduction in damage levels, although
2013 was a good year for rainfall in the south west. WAPRES however is playing a leading role in trying
to discover the answers to these questions and also in trying to quantify the impact of this pest and
to seek effective control measures. This is done through membership of the collaborative Industry
Pest Management Group (IPMG) and through the direct employment of an entomologist on a part
time basis. Already the systemic insecticide Shield (Clothianidin) which is widely used in agriculture
has been shown to give trees at least 2-3 years protection from all browsing insects including weevils
when applied to the roots and targeted operational treatment of plantations began in 2011.

Because early stocking trials in planted blue gum stands in the south west of W.A. had indicated that
800sph was the optimal stocking on most sites, it was initially assumed that this stocking would also
be optimal for coppice stands. As a result all of our coppice stands up until about 2010 were thinned
to a single stem per stump which generally resulted in a stocking of about 700-800sph. Analysis of
inventory data from coppice stands indicated that there was a strong correlation between stocking
and yield with an average increase of 7m3/ha for every increase of 100stems/ha in stocking at age 7.5.
On a significant number of sites (generally higher rainfall) this increased to 10m3/ha for every increase
of 100 stems/ha in stocking. On the basis of this evidence along with other anecdotal evidence
including observations of differences in canopy structures between planted and coppice stems we
changed our coppice reduction prescription in early 2010 to leave an average of 2 stems (1-3) per
stump. It is expected that this will result in significant reduction in productivity decline in coppice
stands at least on medium and high rainfall sites. Recent research trials have also highlighted the
benefit of fertilising coppice stands at about age 1, i.e. before the coppice reduction operation, and
this has become standard practice on most coppice stands over the last few years. Again this is
expected to reduce productivity decline in coppice stands particularly on medium and high rainfall sites.

7.6.  Treatment of Slash Following Harvesting

There is a view that where possible harvesting slash should be retained on-site to conserve nutrients, particularly if it is anticipated that the site will be utilised for plantation development over a number of rotations.

Where coppice has been used to re-establish plantations WAPRES has harvested these plantations with the “cut to length” harvesting system whereby the trees are debarked “at the stump”, resulting in the harvesting slash being retained on the site. While this is an effective harvesting system for organic matter and nutrient conservation, it naturally leads to a significant increase in fire risk for the coppice crop, particularly given the vertical distribution of the slash, which maximises its combustibility. This jeopardises our shareholders principle requirement for resource security but to date we have not found a better alternative.

In contrast until recently on sites to be replanted we have generally employed the “roadside” harvesting system whereby the trees are debarked on the landing resulting in much of the harvesting slash being removed from the site. This has principally been because of our concern about being able to effectively re-establish a new seedling crop with the harvesting slash retained in-situ. It has had the other benefit of greatly reducing the fire hazard for the second rotation. The downside is that organic matter has been removed from the site.

As a result for replanted sites we are now investigating options of spreading the slash back across the site following the completion of key silvicultural operations such as stump poisoning and ripping and/or mounding. The objective is to get the majority of the leaves, twig and bark fractions back onto the site in a compact, non-aerated layer that minimises the subsequent fire risk.

This work is a major focus for an industry collaboration on second rotation management Nutrient levels are closely monitored following re-establishment, particularly as part of formal health surveys and are added where needed to ensure that the full site potential is achieved.

7.7.  Choice of Planting Stock and Establishment Method

Under FSC® POL-30-602, clones, hybrids formed by natural processes, or the products of traditional tree breeding, selection, grafting, vegetative propagation or tissue culture are not genetically modified organisms (GMOs), unless produced by GMO techniques. WAPRES now has significant reserves of genetically improved seed and all plantings are being established using genetically improved seedling stock to maximize dry matter production from our limited land base. This material is derived from conventional breeding systems and WAPRES currently has no plans to use GMOs in its plantation program. GMOs would only be considered in the future in exceptional circumstances and where their use receives strong support from the majority of our stakeholders.

Whilst coppice will generally result in higher second rotation profitability (measured by Internal Rate of Return or IRR) than replanting due to lower costs, our guideline over the last few years has been to allow up to 40% of 2R sites in any harvest year to be replanted using genetically improved stock rather than retaining coppice. This guideline has been aimed at maintaining a continual improvement in the quality of the estate and to maximize dry matter production per hectare in the belief that replanting
on our better sites is likely to lead to higher growth rates (MAI’s) but lower IRR’s than coppicing. This has proved to be the case on high rainfall sites (>950mm/annum).

However even on these sites improvements in coppice management techniques described above (more fertiliser and more retained stems) are likely to result in similar growth rates to replanting. As a result our new guideline is that if a second rotation is considered to be economically viable, it should generally be established by coppice unless the coppice fails to develop adequately due to site or climatic factors.

We are still trying to determine the best guideline for third rotations as we have very little experience with them, but at this stage we are favouring replanting due to concerns with excessive stump size where the stumps are coppiced again.

7.8. Integrated Pest Management

WAPRES employs an Integrated Pest Management (IPM) approach to the management of its plantations and is committed to reducing its reliance on the use of chemicals where this is consistent with its requirement to ensure the productive capacity of its plantations is maintained. This IPM approach includes the following critical steps;

i) correct identification of the pest,

ii) knowledge of the biology of the pest and its natural enemies,

iii) appropriate monitoring of pest populations,

iv) setting of damage (action) thresholds

v) searching for non-chemical control methods and

vi) finally, where there are no acceptable alternatives; using the most appropriate product and the correct rate and at the appropriate time.

Good weed control is extremely important in our water limiting environment and currently no satisfactory alternatives to chemical control have been developed. WAPRES has in the past trialed the use of a plastic mulch to eliminate the need for pre-plant applications of weedicides. However, the results were disappointing and this technique has not been used operationally.

On ex-pastured sites WAPRES uses herbicides to control weeds in both the year of planting as well as in the winter following planting. Sometimes weed control is also required in the subsequent winter; where Teratosphaeria leaf spot disease has caused the loss of the lower crown; where perennial weeds are present; or in combination with a fertiliser application which is likely to stimulate grass and weed growth. On second and subsequent rotation planted sites weed growth is usually less vigorous and weed control is carried out more on an as needs basis, while it is rarely required in coppice stands; apart from very targeted control of declared noxious weeds.

WAPRES are members of the Industry Pest Management Group (IPMG), which has already developed a mesh barrier that protects seedlings from the African Black Beetle (Heteronychus arator) one of our major establishment pests. In the past sites where the beetles were prevalent required a number of
insecticide applications, even to achieve modest survival levels. Now excellent survival levels are being achieved on these sites without the need for any insecticide applications. The IPMG is also investigating biological control methods for one of our major post establishment insect pests, the Eucalyptus weevil (Goniipterus sp.). It has already developed sampling methods and threshold damage levels for this insect pest to ensure that insecticides are only applied when absolutely necessary. The IPMG is also investigating the use of more environmentally sensitive insecticides and biopesticides.

Spring beetles (Liparetus and Heteronyx) have been a major insect pest for many years and are capable of causing a significant amount of damage to seedlings a few months after planting. The yellow belly chrysomelid (Paropisisterna m-fuscum) has also started to cause significant damage to recently planted seedlings with this damage being sustained throughout the year after planting. Initially these insects were controlled using the misting of synthetic pyrethroid insecticide (alpha-cypermethrin). This control method is effective but also potentially kills beneficial insects and the use of the targeted systemic insecticide Shield is used as an alternative. Shield (Clothianidin) is applied as a very low volume (2-5mls) liquid via a “drenching gun” at the base of the newly planted seedling. As noted earlier, Shield is now being applied to older trees as a more environmentally friendly method of controlling browsing insects, compared with the current method of misting synthetic pyrethroid insecticide.

Information on WAPRES’ IPM approach to pest management is contained in its Forest Health Manual and is supported by “Field guide for Eucalyptus globulus plantations in Western Australia and the Green Triangle” developed by the IPMG.

7.9. Principles of Plantation Silviculture

7.9.1. Species Selection

Tasmanian Blue gum (E. globulus ssp globulus) is currently used for most plantation establishments by WAPRES due to its excellent wood properties for pulp and paper making, its rapid growth across a wide range of rainfall zones and soil types, its good disease resistance and its ability to coppice from the stump following harvesting. However as mentioned earlier on some sites with shallower soils Gully Gum (E. smithii) appears to be more drought tolerant than E. globulus although its commercial use is on hold due to high levels of insect attack in many stands.

7.9.2. Cultivation

Most sites will require some form of cultivation to ensure their full potential is achieved. The choice of which cultivation method should be used will depend on site factors such as slope, the presence of any impeding layers in the soil, the likelihood of water-logging and whether it is a first rotation site or not. See WAPRES 4240 - Cultivation.

7.9.3. Weed Control

It is essential that the young seedlings are able to develop in a weed free environment to ensure that the full potential of the site is achieved. The type and rates of herbicide used should take into account the weed spectrum present, the size of the weeds, the soil type and the time of the season but must be in accordance with the label or permit specifications and certification requirements. Chemicals on the FSC® Highly Hazardous list are not used without an approved derogation in place.

If perennial weeds are present a broadcast herbicide application is carried out prior to the cultivation treatment.
Following cultivation an application of pre (and if required) post emergent herbicides is carried out. This may not be required on some second and subsequent rotation sites due to the absence of annual weeds and grasses.

In the winter following planting a second year weed control operation will generally be required to ensure that the young trees continue to develop in a weed free environment.

Any additional weed control treatments are implemented taking into account; the cost of the operation, the expected benefit to the plantation and any possible environmental effects.

Chemicals used to control weeds must be used in accordance with the Public Health Guidelines on the use of chemicals in rural areas contained in the “Health Act (1911) - Health (Pesticides) Regulations 1956” and with the “Country Areas Water Supply Act 1947” and related Environmental Protection Policies for water catchments.

Only herbicides that are registered for use in plantations or have been permitted for use by the National Registration Authority, under the national permit scheme can be used. Herbicides are used in accordance with label and permit requirements.

Only appropriately licensed operators will be allowed to apply herbicides. Supervising staff must also hold the appropriate license. See STATEMENT 03 - WAPRES Chemical Usage Statement and WAPRES 4245 - Pre-plant Weed Control.

7.9.4. Fertilising

Fertilisers are applied to plantations to ensure that the full growth potential is achieved taking into account economic and environmental considerations.

Prior to planting a soil nutrient analysis is undertaken to determine the type and rate of fertiliser (if any) to be used at the time of planting. Actual application of this fertiliser may take place either shortly before or after planting depending on the soil nutrient status, soil type and type of fertiliser used.

Plantations are monitored for nutrient status both informally during routine inspections but also formally during major Forest Health Surveys (FHS) carried out during autumn one and two years after planting where leaf tissue samples are analysed. These will be used as a basis to determine additional fertiliser requirements.

The application of fertilizers in gazetted catchments must conform with the “Country Areas Water Supply Act 1947” and related Environmental Protection Policies for water catchments. Fertilisers will not be broadcast applied within 10 meters of a waterway. See STATEMENT 03 - WAPRES Chemical Usage Statement and WAPRES 4255 - Fertilising.

7.9.5. Planting

Stocking rates for plantations will be based on the results of formal spacing trials and will take into account the need to optimize volume production and piece size, as well as the rainfall and soil characteristics of the site.

Only containerised seedlings are used due to their improved survival and growth performance compared with bare rooted seedlings. Smaller cell sizes (~50cc) are suitable for first rotation sites but larger cell sizes (>80cc) are used for second and subsequent rotation sites. These larger cells are also used for E. smithii seedlings.
Hand planting using a potti-putki or similar planting tube gives the best results and is used in preference to machine planting.

7.9.6.  Insect control

Plantations receive regular monitoring especially at known times of peak insect activity and insecticides are applied when insect populations exceed threshold levels.

Use of insecticides must be in accordance with the Public Health Guidelines on the use of chemicals in rural areas contained in the Health Act (1911) - Health (Pesticides) Regulations 1956 and in water catchments must be in accordance with the Country Areas Water Supply Act 1947 and related Environmental Protection Policies for water catchments. Chemicals on the FSC® Highly Hazardous list are not used without an approved derogation in place.

Aerial application of insecticides must be in accordance with the Aerial Spraying Control Act 1966 and if requested by neighbours a “Spray Application Management Plan for Spraying of Insecticides Close to Licensed Aquaculture Industry” will be prepared.

Insecticides will only be used if they are registered by the National Registration Authority or under a permit according to the national permit scheme. Rates and methods of application must be in accordance with permit and label requirements.

Only appropriately licensed operators will be allowed to apply insecticides. Supervising staff must also hold the appropriate license. See STATEMENT 03 - WAPRES Chemical Usage Statement for WAPRES policy on chemical use and WAPRES 4325 - Insect Control.

8. Monitoring and Measuring

8.1.  Plantation Inspections

Plantation inspections are carried in order to monitor plantation health, schedule maintenance works and fulfil client obligations. The frequency of inspections on WAPRES managed plantations will vary depending on the age of the plantations as follows;

8.1.1.  New Plantings (Year 0 - 0.5)

These plantations are visited at least twice weekly while key operations such as ripping and mounding, weed control, planting and fertilizing are being carried out. Inspections are then carried out at least once a month until the end of the January following planting except where replanting is required. In replant areas the inspection frequency reverts to that for a new plantation.

Targeted inspections to detect swarming spring beetle continue through until about mid - October. These inspections occur on warm, sunny days when these insects emerge from the soil and can cause considerable damage. In areas prone to wingless grasshopper attack, additional inspections may be required in late spring and early summer to monitor populations of this pest.

8.1.2.  Year 0.5 - 2
Inspections of these plantations are carried out at six monthly intervals during the year. The exception is where replanting operations are being carried out. In this case the inspections revert to the same timetable as for the new plantings.

8.1.3. Years 2 - 4

Inspections of these plantations are carried out at six monthly intervals during the year. These generally occur about April and September. However; with adult foliage beginning to develop, the trees will begin to become susceptible to attack from the eucalypt weevil and chrysomelid beetle, especially from the larvae of these insects. As a result additional inspections may be required from the start of spring through until early summer to monitor populations and ensure that the appropriate recommendations for control are made.

8.1.4. Year 5 +

These plantations are inspected at six monthly intervals during the year (about April and September). The younger plantations in this age group however may still also be susceptible to severe attacks from eucalypt weevils and chrysomelid beetles, requiring additional inspections as outlined above for the Year 2 - 4 plantings.

See WAPRES 4345 - Plantation Inspections.

8.2. Survival Counts and Replanting

WAPRES employees carry out formal survival counts during the autumn after planting to determine whether any areas fail to meet the survival objective of 70% over a discrete area of at least 20m x 20m (0.04ha). These areas are replanted in the following winter. This process is described in WAPRES 4335 - Survival Count and WAPRES 4340 - Replanting.

8.3. Forest Health Surveys

WAPRES conducts a formal Forest Health Survey (FHS) in the first and second autumn (~22 months) after planting. The objectives of the FHS are to identify any factors that are having an adverse impact on plantation health that are not readily identified during the routine plantation inspections (e.g. nutrient deficiencies). See WAPRES 4350 - Forest Health Survey.

8.4. Inventory

WAPRES has historically carried out two standard inventories per rotation on plantations it manages at age 4.5 and 7.5. These inventories have however become more targeted over the last couple of years and some plantations may now only receive one inventory per rotation. Three growth models (low, normal and high growth) are then used to grow on the estimated standing volumes from the inventories of its planted stands, but at this stage we do not have enough PSP data from coppice stands to develop a growth model for coppice. This will be rectified in the next couple of years for single stem coppice but it will take much longer to develop a growth model for the multi-stem coppice stands. In the meantime for the single stem coppice stands we have assumed that the CAI between age 7.5 and harvest is the same as between age 4.5 and 7.5. Limited evidence from harvested coppice
stands indicates that this assumption is quite reasonable. Ad-hoc inventories are sometimes carried out at other times, particularly prior to harvesting to assist in the setting of harvesting rates.

**9. FIRE CONTROL.**

As owners and managers of a substantial investment in plantations and as a processor and exporter of large quantities of high quality woodchips, WAPRES has a strong interest in ensuring that the plantations it manages remain free of damaging agents including fire. WAPRES and its predecessor Bunnings Treefarms have been leaders within the plantation industry in Western Australia in fire protection management and this is reflected in the reasonably low losses that have occurred over the last 30 years since the first eucalypt plantation was established near Manjimup.

To ensure that this excellent record is maintained WAPRES continues to place great emphasis on fire protection management and will conform to the Fire Protection Management Policy below.

**9.1. Duty roster**

WAPRES is part of an industry collaborative that maintains a seven days a week, 24-hour a day duty roster throughout the fire season, coordinated by experienced Duty Officers. A dedicated telephone number is maintained for duty officer contact, and this number is made available to all lessors, neighbours, local authorities, bushfire brigades and other relevant individuals and groups including Parks and Wildlife and the Department of Fire and Emergency Services (DFES).

The Duty Officer is responsible for placing suppression crews and equipment on standby across WAPRES’ entire operational area in accordance with Fire Weather Forecasts and fire activity.

**9.2. Equipment**

WAPRES strategically positions its own fire suppression equipment throughout the operational area. The Duty Officer will in accordance with priorities manage the deployment of this equipment.

All equipment is regularly checked during the fire season (at least once per week) with a major annual maintenance program carried out prior to the commencement of each fire season.

**9.3. Training**

WAPRES ensures that personnel involved in fire control activities are trained as outlined in the ‘WAPRES 04 - Minimum Fire Training Requirements for WAPRES staff for Fire Control Activities’.

**9.4. Firebreaks**
WAPRES install firebreaks in accordance with the relevant local authority firebreak orders for both internal and external firebreaks. WAPRES will also ensure that setbacks from power lines conform to Western Power requirements.

Firebreaks receive a maintenance grade where required to minimise the potential for erosion and to ensure that trafficability for fire equipment is maintained. In rare cases where access along firebreaks is compromised by topography, this will be clearly marked on maps and with signs in the field.

9.5. Maps

WAPRES produces detailed maps for all the plantations under its management showing as a minimum, the main access point, compartment boundaries, firebreaks, roads, water points, power lines native bush, sensitive areas and details of adjoining properties including names and contact details where possible.

The maps are available to the property owner, bushfire brigade, local authority and any other appropriate fire agency e.g. Parks and Wildlife and DFES. Copies are available in waterproof containers near the main access point on plantations.

9.6. Water points

WAPRES develops new or upgrades existing on plantation water points to ensure that water is readily available for the refilling of fire units. Where this is impractical (generally on a small plantation) it will ensure that water is available within a 20 minute turn-around time outside the plantation.

Water points are monitored regularly throughout the life of a plantation to ensure that water levels remain adequate.

9.7. Signage

WAPRES signposts all plantations under its management with fire contact information, water point and general access signs to ensure safe access and egress. In particular it will ensure that signs are erected in areas where summer access is 4WD only, where steep slopes exist and where access is impossible past a certain point to ensure fire crews can retreat readily if required.

9.8. Communications

WAPRES installs VHF and UHF radios in all fire units allowing communication with all other fire suppression agencies including local authorities, bushfire brigades as well as Parks and Wildlife and DFES. WAPRES also installs mobile telephones in all key fire units to further improve communications capability.

9.9. Bushfire Brigades
WAPRES liaises with bushfire brigades servicing areas where plantations under its management are established and pays the relevant subscription fees as requested. Where possible a WAPRES employee will attend brigade meetings (as well as local authority fire advisory meetings), and where appropriate WAPRES will make donations to assist in the purchase of essential brigade equipment or the construction of key facilities.

As WAPRES will in most cases rely on the bushfire brigades to provide the initial fire suppression capability in the event of a wildfire occurring on or near one of its plantations, it will make it clear to all relevant brigades that it is willing to assist in brigade prescribed burning activities and is available to carry out fire suppression activities in these brigade areas, even where fires are not directly threatening one of its plantations. Where WAPRES is notified of a wildfire in one of the relevant brigade areas and where assistance is requested, the duty officer will authorise the appropriate equipment to be dispatched if this equipment is not already committed.

9.10. Insurance

WAPRES maintains comprehensive fire insurance cover for its own plantation estate.

10. HARVESTING.

Bluegums are generally harvested after 10 years. At this stage a tree is ideally about 25 metres tall, 25 centimetres in diameter and produces logs upwards of one third of a tonne.

WAPRES plans and supervises the harvest operations within its estate. Local contracting crews are employed to harvest and haul the timber product whilst complying with WAPRES policy and procedures.

Timber must be provided in a continuous managed flow to the Bunbury Port. The limited stockpile area means there is little surplus capacity, and conversely any timber shortfall can prove very costly in terms of lost production. Unpredictable factors such as market conditions, machine breakdowns or bushfires frequently come into play and harvest management must be adaptive in order to respond to the changing environment.

10.1. Harvesting Objectives

WAPRES objectives during harvest operations are:

- To obtain maximum utilisation from plantations using the most cost effective and appropriate methods.
- To use competent personnel to achieve the necessary standards of safety and environmental care.
- To comply with Company and Industry Standards.
- To complete the Harvesting Inspection Report for each plantation, assessing operational, safety and environmental aspects and ensuring operations comply with obligations.

10.1.1. Haulage Objectives:
• To ensure logs are supplied to designated processing centres and loads are secured safely with minimal damage to roads both on & off the plantation.
• To comply with Company & Industry Standards.
• To use competent personnel to achieve the necessary standards of safety and environmental care.

10.1.2. Post-Harvest Objectives:

• To rehabilitate harvested areas to agreed standards, including roads, firebreaks, erosion control and drainage measures where required.
• To ensure operations have complied with obligations to wood owners, landowners, neighbours, and local community.

10.2. Harvest Planning

Planning for harvest starts years before the plantation is of age, in order to prepare for seasonality constraints, production and shipping requirements. Contractor and harvesting system allocations are made considering second rotation requirements, including whether to coppice or replant. WAPRES also considers the returns to the grower, taking into account distance to mill, cost of harvesting and second rotation requirements. Lease constraints are also a major factor.

The planning process includes Due Diligence checks to ensure that the harvest operation will not impact on High Conservation Values and that the wood will comply with Chain of Custody and Controlled Wood requirements. See P16 - Due Diligence System.

A Timber Harvest Plan (THP) is prepared for each harvest operation and copies are distributed to all supervisors, operators and truck drivers. The information provided includes:

• A Timber Harvest Plan Map
• Contract numbers
• Certification details
• Contact details of supervisors and contractors
• Period of harvest operation
• Haulage routes and restrictions
• School bus times and bus driver contacts if applicable
• Fire contact details
• Fire unit requirements
• Emergency evacuation points
• Harvest methods to be used
• Environmental controls
• Exclusion zones
• Refuelling and maintenance guidelines
• Reference to JHAs for known hazards - eg powerlines, steep slopes
• OHS requirements
• Special Values (eg threatened species, cultural sites)
• Threatened Species Identikit

See WAPRES 5050- Pre-Harvest Information and WAPRES 5060 - Timber Harvest Plan.
10.2.1. Road Building

Plantation roads generally require upgrading prior to harvest to accommodate haulage vehicles. Ideally this occurs two years prior to the proposed harvest, or as soon as practicable once a plantation is scheduled.

Consideration is given to landowner preferences, existing alignments, expected traffic volume, soil characteristics, drainage, and sensitive areas.

Liaison with local government, landowners, neighbours and the Department of Parks and Wildlife may be required during the planning and building process. Permits are obtained for haulage vehicles to use local government roads.

See WAPRES 5070 - Road Works Plan and WAPRES 5080 - Road Works.

10.2.2. Neighbour Notification

WAPRES distributes Harvest Notifications to landowners and neighbours to the plantation and along haul routes. The notification contains information on the operation, haul route, harvest period and contact details of WAPRES supervisors.

Any queries or comments from stakeholders are addressed to WAPRES’ best ability and are recorded on the relevant plantation file.

10.3. Harvest Operations

Plantations are harvested either with a single grip harvester (fell, process and cut to length at the stump) or a feller buncher (felled, bunched and left in tree length for extraction to roadside).

The logs are collected either using a Forwarder or by a Skidder. The Forwarder grapple is mounted on the boom and hoists groups of logs onto a carry bay. It collects a full bay of logs before returning to a landing at the edge of a haul road. It can then stockpile the wood whilst waiting for a truck or load the logs directly onto a truck. The Skidder extracts bunches of logs to roadside for processing and loading to trucks. Experienced operators are capable of harvesting and loading in excess of 200 tonnes of logs per day in good forest conditions.

Conventional Harvesting - which incorporates a Single Grip processor used to harvest and process the logs, (debark and cut to length) and a forwarder to carry the logs to a loading site. This technique is suitable for high production sites with rough steep ground, and small difficult blocks.

Roadside Harvesting - which uses a Feller Buncher (using either shears or a bunching saw) to harvest the trees and a skidder to extract the trees to roadside where a Single Grip processor processes the logs, which are then loaded onto trucks. This technique is suitable for very good stands of timber with level ground for the infield chipper processing site.

Mobile chipping units are also used to process logs into chips in the field. This method utilises a Feller Buncher (using either shears or a bunching saw) to harvest the trees and a skidder to extract the trees to roadside where the Infield Chipper processes the trees into chips. The chips are either loaded directly, or via a portable screen, onto the haulage trucks. This technique is most suitable for plantations with low yields and poor form trees, along with relatively level areas for the infield chipper processing site.
10.3.1. Supervision

The level of supervision by WAPRES varies with the complexity of the operation, quality of the contractors' work and site conditions. Daily supervision may be required during commencement of operations, when new contractors are engaged and when operating conditions are changing or approaching sensitive levels where risks of impact on soil, water, road or landscape quality increase.

See WAPRES 5090 - Supervision of WAPRES Harvesting Operations.

10.3.2. Safety

Harvesting in Progress signage is placed at the entry to plantations or relevant compartments warning of restricted access and specifying the UHF call up channel. Signage also states the required PPE - at a minimum high visibility clothing, safety boots and a hardhat to be worn at all times when outside a vehicle. Machinery exclusion zones are to be observed at all times.

JHAs are prepared for potentially dangerous tasks such as operating on steep slopes and near powerlines.

When loading trucks, the Truck Driver must stand outside the vehicle in a safe location and be visible to the loader operator during the loading of each bay.

10.3.3. Environmental Considerations

Pre-harvest planning identifies special values relevant to each operation. A threatened species identikit tailored to each plantation is provided to the harvest crew. Operators also have access to the booklet Special Values of the SW Plantation Estate which contains more information on threatened species and ecosystems. If a threatened species is identified in the harvest area, operations are to stop and a WAPRES supervisor is to be notified. The species will be reported to DPaW with a Fauna/Flora Report Form.

Any oil or hydrocarbon spills are required to be cleaned up, regardless of size. Spills over 20L are to be reported and raised as a WAPRES F2.0 - Incident Note. Refuelling and vehicle maintenance is prohibited to occur near watercourses.

See WAPRES 9020 - Chemical and Hydrocarbon Incident Management Guidelines

All areas of remnant vegetation are operational exclusion zones and vehicle entry is prohibited unless authorised by a WAPRES Supervisor.

Buffer zones around watercourses are in place with the following certification requirements.

For FSC® Forest Management requires buffer zones to be 10 metres from both river/stream edges, and 2 metres from either side from the centre of drainage lines

For FSC® Controlled Wood requires buffer zones to be 6 metres from both river/stream edges

Additionally, any water course crossing require approval by WAPRES before being used.

Harvest debris is not permitted to be deposited in watercourses (temporary crossings may be constructed using harvest debris however must be approved by WAPRES Supervisor and be removed when harvesting has been completed).
If soil damage exceeds the trigger point of 30m long by 30cm deep, operations are to cease and the **Harvesting Supervisor** is to assess the situation and consider strategies to avoid further damage. An **WAPRES F2.0 - Incident Note** is raised. If more than 2% of a compartment is affected, operations must cease until conditions improve. See **WAPRES 5400 - Field Assessment of Soil Damage**

Dust from haulage vehicles on unsealed roads can be an issue to residents along haul routes. Strategies such as reducing speed limits, using dust suppressants, or altering routes or times may be implemented by the **Harvesting Supervisor**.

Turbidity (the level of cloudiness of water) is monitored by the **Harvesting Supervisor** when streams run through harvest areas. Any increase in turbidity is raised as an **WAPRES F2.0 - Incident Note** and measures are taken to identify and address the cause. See **WAPRES 9010 - Environmental Monitoring Guidelines**.

Spread of weeds or Phytophthora dieback is prevented by keeping to tracks, the washdown of vehicles and avoiding machine operation in excessively wet areas. See **WAPRES 9040 - Hygiene Control in Plantations**.

### 10.3.4. Weather Conditions

Operations may be halted during periods of high fire risk, extended or heavy rain or high wind. All harvesting, extraction and vehicle movements on plantations must cease when a Shire introduces a Vehicle Movement Ban or Harvest Ban, unless prior permission to continue has been obtained in writing.

### 10.3.5. Fire Prevention

Each harvesting unit is required to have a fire unit and for this to be fitted and operational during the restricted burning period. Each machine is fitted with a fire extinguisher.

### 10.3.6. Asset Utilisation

Waste Assessments are conducted if it appears that wasted wood fibre (eg excess stump height, discarded logs) is exceeding a level of 2.5 tonnes per hectare. See **WAPRES 5090 - Supervision of Harvesting Operations** for details.

### 10.3.7. Haulage

Logs and chips are transported to processing facilities by heavy haulage vehicles operated by specialist contractors. The trucks are equipped with many features designed to optimise efficiency without any compromise to safety or road wear. Such features include fixed high stanchion log trailers and trucks fitted with Central Tyre Inflation (CTI). All contractors must comply with load and vehicle length specifications required by road authorities and with the FIFWA Code of Conduct for Timber Haulage. WAPRES also complies with the National Heavy Vehicle Regulator Chain of Responsibility requirements.

### 10.3.8. Chain of Custody

Unique barcoded delivery tickets are developed for each harvest operation and are provided to truck drivers for each load. This barcode is required for entry to the Port and allows the tracking of product from each plantation.

See: **WAPRES P15 - Chain of Custody**
10.4. Post Harvest

On completion of a harvest operation, WAPRES Harvest Supervisors conduct a Harvest and Haulage Inspection to determine all conditions were followed. Any breaches result in WAPRES F2.0 - Incident Note being raised against the relevant contractor.

No rubbish is permitted to be left onsite. Any damage to fences or infrastructure must be repaired.

This inspection may also note requirements for remedial work such as grading rutted firebreaks, repairing road damage, ripping areas of compacted soil, rehabilitating gravel pits or repairing fences.

WAPRES advises and supervises contractors to complete the required work.

The tree stumps remain, and the slash material is usually left to break down naturally on the ground. See: 7.6 - Treatment of Slash Following Harvesting.

If the plantation lease continues, management reverts back to Foresters who will make preparations for the establishment of the next rotation.
DOCUMENT REVIEW:

To be updated as required or reviewed within a 12-month period by Management Systems personnel, the Compliance and Systems Manager, and Plantation Operations Manager and approved by the Chief Executive Officer.

REFERENCES:

Aerial Spraying Control Act 1966

AS 4708 The Australian Forestry Standard


Country Areas Water Supply Act 1947

FSC-GUI-30-001 Pesticide Policy: Guidance on Implementation

FIFWA (2014) Code of Practice for Timber Plantations in Western Australia


Health Act (1911) - Health (Pesticides) Regulations 1956


SCS Interim Standard for Natural Forest and Plantation Forest Management Certification in Australia Under the Forest Stewardship Council®

Stewart, B. A (2011) An assessment of the impacts of timber plantations on water quality and biodiversity values of Marbellup Brook, Western Australia. Environmental Monitoring and Assessment 173:941-953

WAPRES 05 - WAPRES High Conservation Value Management Plan
WAPRES 06 - WAPRES Environmental Management Plan
WAPRES 07 - WAPRES Fire Management Plan
WAPRES Statement 01 - Good Neighbour Statement
WAPRES Statement 03 - Chemical Usage Statement
WAPRES Policy 02 - Plantation Management Policy
WAPRES P16 - Chain of Custody
WAPRES 04 - Minimum Fire Training Requirements for WAPRES staff for Fire Control Activities
WAPRES 4240 - Cultivation
WAPRES 4325 - Insect Control
WAPRES 4335 - Survival Count
WAPRES 4340 - Replanting
WAPRES 4345 - Plantation Inspections
WAPRES 4350 - Forest Health Survey
WAPRES 5070 - Road Works Plan
WAPRES 5090 - Supervision of Harvesting Operations
WAPRES 5092 - Harvesting Operational Requirements
WAPRES 5098 - Post Harvest Remedial Work
WAPRES 5400 - Field Assessment of Soil Damage
WAPRES Environmental Care Manual Documents
WAPRES 9000 - The Principles of Environmental Care

WAPRES 9010 - Environmental Monitoring Guidelines

WAPRES 9040 - Hygiene Control in Plantations

WAPRES 9020 - Chemical and Hydrocarbon Incident Management Guidelines

WAPRES 9050 - Hygiene Control in Plantations

WAPRES 9060 - The Protection of Soil and Water Resources in Plantations

Special Values of the South West WA Plantation Estate

# REVISION HISTORY:

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## APPENDICIES:

None.