



1. PURPOSE / OBJECTIVES

There are a number of pests, diseases and weeds in Western Australia that impact plantations and native forests. The cost of managing pests is substantial, however the cost to the environment and the productive capacity of the forests would be far greater without management. The purpose of this procedure is to describe the monitoring and management of endemic or established pests, diseases and weeds. This procedure does not cover biosecurity High Risk Site Surveillance (HRSS) for exotic pests, with the exception of targeted surveillance for *Sirex noctilio* and Declared Weeds.

The objectives of this procedure are:

- To describe monitoring and management practices at different stages of forest operations; and
- To identify appropriate reporting and recording of monitoring and management practices.

2. COMPLIANCE REQUIREMENTS (LEGAL AND 'OTHER')

The legal responsibility for pests, diseases and weeds resides with the land owner in respect to private property and with the vested authority in respect to crown lands. The Forest Products Commission (FPC) has a responsibility to prevent the introduction and/or spread of pests, disease or weeds through its activities on both private and crown land to meet its obligations under the The Forest Management Plan 2014-2023 (FMP), the Australian Forestry Standard (AS:4708) and the Forest Stewardship Council Controlled Wood Standard. To help achieve these obligations the FPC works cooperatively and collaboratively with both land owners and the Department of Parks and Wildlife (P&W).

The FMP governs the FPC's responsibilities within its boundaries and takes into account relevant provisions of the following legislation administered by P&W:

- *Conservation and Land Management Act 1984*
- *Conservation and Land Management Regulations 2002*
- *Forest Management Regulations 1993*

In addition the whole of the State is governed by the *Biosecurity and Agriculture Management Act 2007* which is administered by the Department of Agriculture and Food WA (DAFWA).

Notwithstanding legal obligations, the FPC also has a responsibility to maintain productive capacity of the forests it manages and may undertake activities that aim to eradicate or control damaging pests, disease and weeds in affected areas.

A priority list of Plant Pests and Diseases of importance to the FPC is maintained and updated annually by the Project Manager Forest Health. This list can be found on the intranet at *Forest Operations/Forest Health/Endemic and Established pests*. Annual pest and disease surveillance and management is guided by this priority list.

3. OPERATION and CONTROLS

3.1 Planning and Preparedness for disturbance activities

Planning

The planning and approval for all disturbance activities must be carried out in accordance with Procedure 95 *Approval for Disturbance Activities*. On State Forest, Timber Reserves and land held in the name of the Executive Director of P&W within the boundaries of the FMP, the FPC requires an authorised DP&W FEM 019 *Planning checklist for disturbance activities*.



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For plantations on Private Property (under lease or freehold), the FPC 47 *Planning checklist for disturbance activities on sharefarms* form is to be completed and authorised by the relevant FPC Plantation Regional Operations Manager.

Disturbance operations undertaken on crown land in the arid rangelands require a FPC446 – *Arid pre-operation checklist and approval to commence* form approved by the Sandalwood Branch Manager before disturbance operations can commence.

These planning checklists are used to identify any priority pest, disease or weed within the operational area as well as relevant management considerations. In relation to disease, it is primarily used to identify *Phytophthora cinnamomi* status and management, but may also include other priority disease(s) (eg *Armillaria luteobubalina*) within the operational area. Information from this checklist then guides the development of a Hygiene Management Plan (HMP) for the operation.

In relation to weeds it is primarily used to identify any declared, prohibited or moderate - high rated environmental weeds within the operational area. Identified Declared Weeds are included in the Hygiene Management Plan (HMP) for the operation.

See <https://www.agric.wa.gov.au/organisms> for a list of declared weeds (contains all declared organisms)

See <http://www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-does-dpaw-manage-weeds> for weed prioritisation by region.

Several reference books are available for weed identification, however nomenclature can vary between them. For consistency, names used in the book *Western Weeds; A guide to the weeds of Western Australia* (Hussey *et al.* 1997) should be followed.

The approval of the operation cannot occur without related plans such as, the “Hygiene Management Plan”, “*Phytophthora cinnamomi* Management Map” and “Road and Basic Raw Material Plan”, where they are identified as being required, as all values must be assessed in one process.

The FPC 421 *Plantation Management Plan Private Property* identifies the need for adequate fencing to keep stock out as well as the identification and treatment of rabbit warrens by the land owner.

Rabbit control is planned in sandalwood regeneration areas if the presence of rabbits is identified by scats and diggings during the survey for suitable regeneration areas. The planning process also identifies areas under heavy grazing pressure from cattle, sheep or goats and these areas are excluded from regeneration programs.

In native forests within the FMP boundary, it is the responsibility of the Manager Planning and Native Forest Silviculture to identify any sensitive fauna species that may be impacted by an increase in feral animal activity during, or after, the disturbance activity. The Fauna Distribution Information System (FDIS) is used to assess the risk in each proposed harvesting coupe during the planning process. If the FDIS report suggests the presence of sensitive fauna species then P&W must be consulted to determine the appropriate management actions necessary to ameliorate any impacts.

Pre-Operation

Any priority pest, disease or weed identified during the planning process must be included in either:

- FPC 111 *South West Forests pre-operation hazard identification and site handover sheet*,
- FPC 377 *Plantation pre-operation hazard identification and site handover sheet*,
- FPC 378 *Plantation operations hazard identification and site handover sheet - silviculture*,
- FPC 446 *Arid pre-operation checklist and approval to commence*; or
- FPC 114 *Road construction and maintenance briefing checklist*.



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These forms are to be discussed with the contractor during the site induction and handover. This is necessary to ensure the contractor is aware of potential damaging agents and that they conduct their operations in such a way as to prevent the spread and/or movement into, or out of, the operational area.

3.2 Monitoring and management during disturbance activities

There are a number of contractor procedures that relate to the monitoring and management of pests disease and weeds during forest operations. The primary procedures are:

- E2 *Management of the spread of weeds and disease;*
- R1 *Pre-operation roading briefing;*
- H1 *Pre-operation harvesting briefing;*
- R8 *Basic Raw Materials;*
- 802 *Sandalwood operation access;* and
- 803 *Sandalwood tree selection and harvesting*

These procedures may also refer to other procedures, checklists or forms designed to minimize the introduction and spread of damaging agents.

The procedures outline obligations for both FPC staff and FPC contractors. FPC staff must be familiar with these procedures and regularly monitor and assess contractor performance against requirements.

Monitoring of pests, disease and weeds identified in the HMP is part of the assessment of contractor performance and is done through routine visits to site by the FPC operation supervisor and recorded on either:

- FPC 105 Harvesting inspection and action sheet (native forests);
- FPC 106 Contractor Inspection and Action app (plantations);
- FPC 882/883 Contractor roading inspection and action sheet(s);
- FPC 3855 Contractor inspection and action (sandalwood) app; and
- FPC 697 Clean on Entry form and app.

Contractors and FPC staff are required to present to worksites with machinery and vehicles clean of soil. This prevents the transmission of soil born weeds and disease from one site to another.

With respect to *Phytophthora cinnamomi*, specific requirements for each operation will be identified in the relevant HMP and *Phytophthora cinnamomi* Management Map. Entry in to Disease Risk Areas (DRA) and provisions for Clean-on-Entry (exit) are governed by the *Conservation and Land management Act (1984)* (Part VII) and the *Forest Management Regulations (1993)* (Part 16) and must be abided by all staff and contractors.

In managing *Phytophthora cinnamomi* in its' operations the FPC must use the P&W *Phytophthora cinnamomi and disease caused by it- Vol. 1 Management Guidelines*.

3.3 Post activity monitoring and management

Areas managed by the FPC are most vulnerable to damaging agents in the first three years after establishment or germination.

It is a requirement of the FMP that where possible, treatment of any damaging pests, disease or weeds detected should be carried out as soon as practicable after detection.



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3.3.1 Native Forests

The FPC has a responsibility to monitor and manage pests, disease and weeds in its operational areas until they are formally handed back to P&W. Acceptance of the areas by P&W is validation that the areas have not been degraded by pests, disease and weeds and that the FPC has met its obligations.

Annual survival assessments of planted areas are conducted at the end of each growing season to assess whether areas meet minimum stocking standards. The regeneration survival counts are done in accordance with P&W - Karri Regeneration Survey (Draft). Damage caused by insects or browsing animals, or the presence of Myrtle rust can be noted in this assessment. Replanting areas that fall below the minimum standard is often a more efficient means of maintaining standards than trying to control damaging agents. Where rabbits are identified as a cause of failure, rabbit control by baiting (Technical Specification TS-V-10) is implemented prior to replanting.

During the regeneration survival count operation the P&W – Survey worksheet (draft) will be completed. The completed regeneration survey worksheet will be used to complete the FPC115 – *Karri / Jarrah post-harvest regeneration survey summary sheet*.

The Manager Planning and Native Forest Silviculture is responsible for ensuring regeneration survival counts are done, stocking is at or above acceptable limits and that damaging agents identified are dealt with appropriately.

Monitoring of Armillaria root disease (*Armillaria luteobubalina*) is limited to post thinning assessments in karri forests. Identification and symptoms of this disease can be found in the *Field Guide for recognising the symptoms of Armillaria root disease in karri and wandoo forest*. The numbers of infected crop trees and stumps within a 10m radius of each sample point should be recorded as well as the percentage of samples points with infections. These records are kept on the FPC 453 *Karri post-thinning stand density report* and stored on the relevant coupe file.

The Manager Southern Harvesting is responsible for ensuring that the post thinning assessments for Armillaria root disease are conducted, records are maintained and appropriate actions taken where required.

3.3.2 Plantations

Records of inspections are to be kept using the FPC 416 *Plantation and Property Inspection report* mobile app with results stored in a central database accessed via the intranet (*Forest Operations/Electronic Data capture (EDC) Data Store/FPC 416*).

Plantations should be regularly monitored in the first three years after establishment. Inspections should occur frequently in the first six months after planting. As a guide, inspections should be undertaken once a fortnight during this early establishment phase. Frequency of monitoring after this initial period will be dependent on pest activity and risk of further activity in the area. Inspections should be quarterly from 6 to 18 months and bi-annually from 18 months to 3 years. The Manager Plantation Silviculture is responsible for maintaining this inspection program, monitoring information in the database and determining if and what management intervention is required for all plantations up to three years-old.

Plantations older than 3 years of age should be routinely inspected for pests, diseases and weeds. Inspections for pests and diseases should be in Spring, when activity and symptoms will be most evident and Autumn when damage can be assessed. Staff should be familiar with pests and diseases listed in the priority list of Plant Pests and Diseases of importance to FPC. This list can be found on the intranet at *Forest Operations/Forest Health/Endemic and established pests*. A range of information sheets covering these pests and diseases can be found on the intranet at *Forest Operations/Forest Health/Endemic and established pests/Resources/* for each of the categories. The Operations Managers for the Northern,



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Central and Southern plantation regions are responsible for maintaining this inspection program, monitoring information in the database and determining if and what management intervention is required for all plantations greater than three years-old within their region.

Plantation species that spread beyond plantation boundaries are considered weeds and the FPC must monitor and control the spread of these species.

FPC staff should notify P&W if any declared, prohibited or moderate - high rated environmental weeds are recorded within or surrounding plantation areas.

Where necessary, treatment of any detected damaging pest, disease, or declared weed should be carried out as soon as practicable after detection. Treatments should be applied as per the appropriate *Technical Specification* (intranet/Forest Health/Endemic and Established Pests/Control/Technical Specifications) and recorded on either:

- FPC 411 *Insecticide application summary*;
- FPC 447 *Wingless grasshopper bait application summary*;
- FPC 405 *Herbicide application summary*; or
- FPC 440 *Vertebrate Control Data form*.

Forms should be stored on the appropriate coupe or plantation file.

3.3.3 Sandalwood

Where rabbits are in high enough numbers to be considered a threat to successful regeneration of sandalwood, rabbit control by baiting (Technical Specification TS-V-10) is implemented prior to or after reseedling. Rabbit control is conducted during the summer months when natural food is low. The effectiveness of this treatment is noted during the seedling surveys in April, and if the sandalwood seedlings appear to have been grazed then the area is rebaited. Rabbit baiting will be conducted until seedlings are large enough to be unaffected by grazing, usually 2 years.

3.4 Nursery and Seed Centre

The West Manjimup Nursery and Seed Centre maintains accreditation with the Nursery and Garden Industry Western Australia. A major component of the accreditation is related to the hygiene of the nursery to restrict any transfer of pathogens or other plant or soil contaminants into the nursery. Strict hygiene requirements are in place at the nursery and staff must familiarize themselves with these requirements prior to entering the nursery. Hygiene requirements relating to weeds, pests and disease prevention, monitoring and management is governed by the *West Manjimup Nursery manual* (2012).

The FMP requires the FPC to take appropriate steps to minimise the risk that seedlings from the nursery could transport unwanted pests, disease or weeds into the forest.

Hygiene monitoring records are maintained through;

- FPC36 *West Manjimup Nursery and Seed Centre Myrtle Rust questionnaire for visitors*;
- FPC502 *Nursery media record sheet*;
- FPC688 *Nursery tray hygiene sheet*;
- FPC689 *Nursery beginning/end of season hygiene records sheet*;
- FPC1069 *Annual check for soil steamer temperature gauge (Windy Hill)*; and
- FPC1077 *Nursery pre-dispatch stock QC*.

3.5 Targeted surveillance

Targeted surveillance is conducted for *Sirex noctillio*, which is currently in Australia but not in Western Australia, as well as identified areas of Declared Weeds. Targeted pest and disease surveillance requires the establishment of traps that are regularly checked and maintained and focus on specific times of the year when detection is most likely. The Declared Weed surveillance monitors control or eradication progress of identified infestations.

3.5.1 *Sirex wood wasp (Sirex noctillio)*

Western Australia is the only state free of *Sirex*, therefore monitoring of pine plantations is critical for early detection. Procedure 36 *Sirex prevention, management and surveillance* and Work Instruction 37 *Panel trap establishment for Sirex monitoring* details monitoring methods to be used and management actions required if detected. Surveillance is conducted from December to April.

Records of trap inspections are recorded using the FPC 134 *Targeted Surveillance* app (on mobile devices) and stored in a central database accessed via the intranet (Forest Operations/Electronic Data capture (EDC) Data Store/FPC 134).

The Project Manager Forest Health is responsible for maintaining this surveillance program, monitoring information in the database and managing an incursion if detected. (*FMP Management Activity 31.1*)

3.5.2 Declared Weeds

Initial detections of Declared Weeds reported through either the planning process for disturbance activities (DPaW FEM 019, FPC 47, FPC 446) or routine plantation and property inspections (FPC 416) need to be monitored throughout the length of the control/eradication process for each infestation.

Monitoring the status of the infestation and the effectiveness of treatments should be done by field staff using the FPC 134 *Pest, Disease and Weed Targeted surveillance* app., with records of this monitoring stored on a central database accessed via the intranet (Forest Operations/Electronic Data capture (EDC) Data Store/FPC 134).

The Project Manager Forest Health is responsible for maintaining this surveillance program and monitoring information in the database.

3.6 Routine Observation

In addition to the specific monitoring outlined above, staff should be vigilant when working in the forest and report any grouped tree deaths, new, unusual or unknown pests, pest activity, tree disorder or weed occurrence that they observe.

These reports should be directed to:

- Native Forests – Manager Planning and native Forest Silviculture
- Plantations – Manager Plantation Silviculture
- Arid Forests – Manager Sandalwood Branch

It is their responsibility then to have the unknown/unusual organism or occurrence identified and initiate any required remedial actions.



4. RESOURCES

4.1 Insects and diseases

Butin, H. (1995). *Tree diseases and disorders. Causes, biology and control in forest and amenity trees.* Oxford University press.

Chapman, S. (1998) *Field guide to common pests, diseases, and other disorders of radiata pine in New Zealand* Forest research Bulletin No 207. New Zealand Forest Research Institute Limited.

Forests and Timber: A field guide to exotic pests and diseases (2000). Department of Agriculture, Fisheries and Forestry – Australia.

Hansen, E.M. and Lewis, K.J. (1997). *Compendium of conifer diseases.* American Phytopathological Society Press, St Paul Minnesota.

Makinson, R.O. (Ed) (2012). *Myrtle rust – a new threat to Australia’s biodiversity. Myrtle rust recognition, reporting, risk assessment, impacts, and management concepts and techniques – Workshop notes.* Australian Plant Conservation Network, Canberra, June 2012.

Western Australian Organism List (WAOL). <https://www.agric.wa.gov.au/organisms>

Wylie, R., McDonald, J., Wardlaw, T. and Lawson, S. (2006). *Forest Health Guide: Symptoms of insect and fungal damage on trees.* Department of Primary Industries and Fisheries Queensland.

4.2 Weeds

Flora Base. <https://florabase.dpaw.wa.gov.au>

Hussey, B.M.J., Keighery, G.J., Cousens, R.D., Dodd, J. and Lloyd, S.G. (1997). *Western Weeds: A guide to the weeds of Western Australia.* Plant Protection Society of Western Australia (Inc.) Victoria Park.

Lamp, C. and Collet, F. (1984). *A field guide to Weeds in Australia.* Inkata Press, Melbourne.

Western Australian Organism List (WAOL). <https://www.agric.wa.gov.au/organisms>