



Forest Health Surveillance



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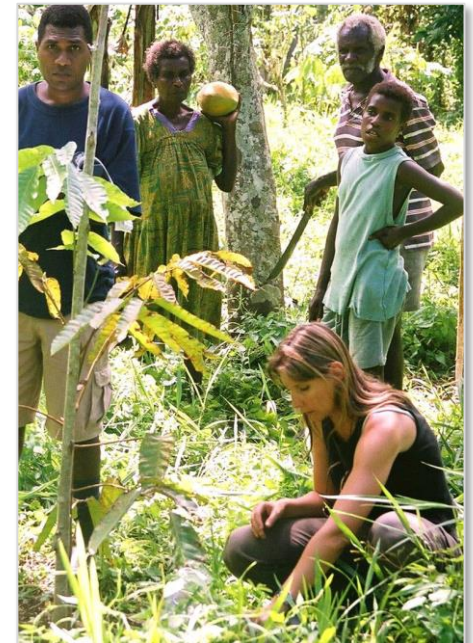
**Queensland
Government**

Past & current surveillance

Forest Health Surveillance has been operating in Queensland since 1996

- **Qld softwood plantations** Qld Government, Hancocks Queensland Plantations (HQP)
- **Qld hardwood plantations** (Hardwood Qld Program)
- **Industry:** Integrated Tree Cropping hardwood plantations
Santos, hardwoods revegetation sites
New Forests hardwood plantations
Elders Forestry, sandalwood plantations in WA
QUINTIS, sandalwood plantations in NT & WA
- **Indigenous Ranger FHS Training:** K'gari (Fraser Island)
East Arnhem, Northern Territory
Tiwi Islands, Northern Territory
- **Urban forestry:** High Risk Site Surveillance
Training Council field staff and Arborists
- **ACIAR Projects:** Establishing and teaching surveillance techniques
in the South Pacific Islands:
Fiji, Tonga, Samoa, Vanuatu

Establishing and teaching surveillance techniques in
south east Asia:
Vietnam, Laos, Cambodia, Thailand

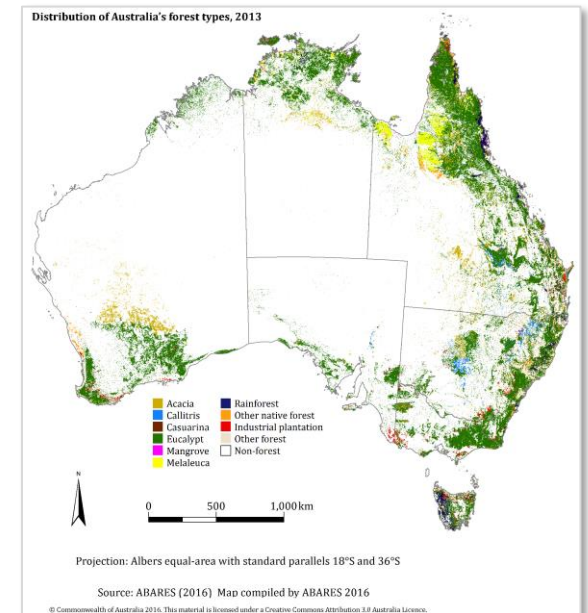


Forest health surveillance, Vanuatu

Why is forest health and biosecurity important?

Australian Forests

- 123 million hectares (98%) of native forests and 2 million hectares (2%) of plantation forests
- Queensland's forest and timber industry value chain contributes \$3.2B to the State's economy and employs around 10,000 people.
- The softwood industry supplies raw materials that contribute >550M
(Queensland Forest & Timber Industry Overview 2016)
- The threat of losses from exotic pests and pathogens is real and increasing.





Forest Health Surveillance

- Refers to the status of key ecological and physiological processes of the forest species
 - growth, photosynthesis, respiration, nutrition, water uptake
- In a healthy forest these processes are operating within their normal bounds
- In an unhealthy forest these processes are abnormal and may lead to decline
- Factors influencing forest health include:
 - biotic (e.g. pests and pathogens) and
 - abiotic (e.g. nutrients, climatic) agents
 - human activities (e.g. operational, management)



Foliage pathogen *Teratosphaeria* sp. spread to the eucalypt plantation from the surrounding native forest. It destroyed the plantations near Gladstone, Queensland.

- **Endemic Pests** are known to occur naturally in Australia

- *Kirramyces* spp.
- Chrysomelid leaf beetles



Quambalaria shoot blight foliage pathogen

- **Exotic Pests** are not currently present, or established, in Australia

- Mountain pine beetle
- Red needle cast

- **Established Pests** are exotic pests that have become established in Australia

- Sirex wood wasp
- Giant pine scale



Sirex wood wasp damage



Purpose of Forest Health Surveillance

- Assess the health of plantation trees, native forests and particular tree species around high-risk sites
- Detect emerging pests & diseases and Identify damaging agents
- Provide timely advice for management
- Provide base for research on management of key pests & diseases. FHS is effective in detecting a number of new and emerging pests, evaluating their potential impact and assisting in focusing future research efforts.
- Report yearly on the health of the forest and trends over time
- Reporting on presence or absence of pests and diseases for market access



Surveillance methodology

Active surveillance – carried out by forest health experts

Aerial

- carried out annually in aircraft
- carried out remotely using drones
- carried out remotely using current satellite imagery

Drive-through

- carried out quarterly around plantations. Stop occasionally and walk into the forest 100m
- vantage points are a good way to see large areas of forest

Monitoring plots – permanent plots to assess crown, stem and branches

Transects – assessing trees along a 50 or 100 m line

Call-outs – Industry and Landowners requesting inspections

Trapping

- insect traps with pheromone lures established around points of entry to Australia and other high risk sites



Surveillance methodology

Passive surveillance – The observation of pests and diseases during routine work.

Carried out by trained Forestry Rangers, Indigenous Rangers, Council field staff and Arborists.

Training includes:

- Pest, disease and nutritional disorder symptom recognition and field identification
- Biosecurity priority pest and disease awareness
- Reporting suspect pests and pathogens
- Importance of equipment hygiene
- Field sample collection techniques
- Field photography
- Useful websites and apps

Symptom recognition

- **Chlorosis**



Isolated sandalwood trees with crown chlorosis.



Tree roots and stem showing what appears to be a fungal "stocking" growing on the stem.



Sandalwood roots and stem with internal wood rot.

- **Dieback**



Affected trees are dying from the lower branches upwards



Borer holes found in the tree roots



Phoracantha sp. longicorn larva chewing in the cambium of the tree. The primary agent causing the dieback.

Symptom recognition



The new shoots appear to have been eaten.



Dieback of new shoots on young Eucalyptus tree.



Dying shoot of CCV



Enlarged image showing the affected and healthy zone. This is where the tip breaks off.

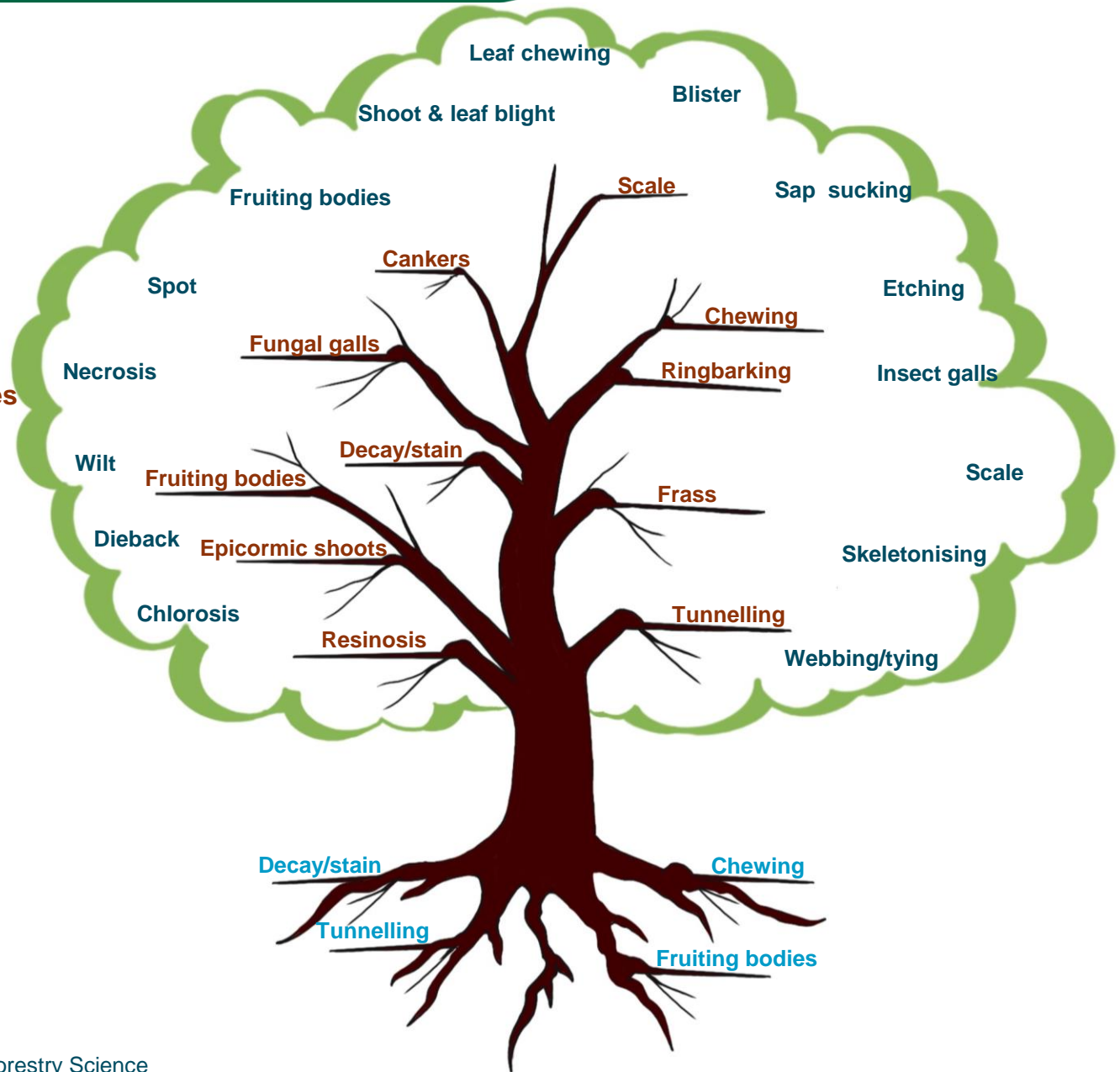


The new shoot became brittle and broke off giving the appearance of having been chewed off.

Pest & disease information tree

Symptoms

- Found on foliage
- Found on stem & branches
- Found on roots



Trained officers are able to:

- Recognise key insect pests and diseases symptoms – native and exotic.
- Recognise and record pest and disease damage correctly.
- Properly collect and process insect and disease specimens for diagnosis.
- Record field data.
- Help with management recommendations.



Giant wood moth (*E. cinereus*)
damage on mature eucalypt

Surveillance Training



Qld Arboricultural Association (QAA)



Ranger coordinator Tiwi Islands



East Arnhem Indigenous Rangers



Tiwi Island Indigenous Rangers



K'gari (Fraser Island) Butchella Indigenous Rangers



Quintis sandalwood plantations field staff NT




Tiwi Island Indigenous Rangers



K'gari (Fraser Island) Butchella Indigenous Rangers



East Arnhem Indigenous Rangers

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- **The following officers are now trained in pest and disease symptom recognition and forest biosecurity.**
 - Approximately 250 council staff in Brisbane, Sunshine Coast, Gold Coast and Scenic Rim
 - 120 QAA Arborists in south east Qld
 - 15 Quintis sandalwood plantation field staff
 - 8 K'gari (Fraser Island) Rangers
 - 5 East Arnhem Rangers
 - 9 Tiwi Island Rangers
 - This improved form of surveillance expands our detection and reporting capacity.
 - Early detection offers the only possibility for eradication or containment of exotic organisms.



Tea shot hole borer (*Euwallacea fornicatus*) vector for a *fusarium* sp. pathogen



Typical Tuckeroo tree dieback



Borer holes with staining and frass



High Risk Site Surveillance

Mapping and tree health assessments.

Change in tree health provides an important visible indicator of the effects of invasive pests and pathogens.

- Pine and Eucalypt trees in close proximity to AAs (Approved Arrangements) were located remotely using Google street view. From this a spatial dataset of tree locations was created and the trees were mapped.
- Using these maps tree health assessments were carried out by ground truthing.
- These baseline data combined with the mapping will be used for ongoing surveillance activities and trapping.

What is a high-risk site?

A place where invasive organisms can enter the country and become established, threatening our native forests and forest industries.

Examples of forest biosecurity high risk sites:

- International ports & airports
- Quarantine Approved Arrangements (AAs) – Locations where Shipping containers are opened away from the port
- Timber importers
- Sawmills
- Hardware stores
- Garden nurseries
- Places of interest / tourist attractions. Places where foreign visitors may visit e.g. botanical gardens



