Euwallacea fornicatus and Fusarium euwallacea (PSHB)

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How to manage infestations and rebuild!

Reproductive hosts: trees PSHB are able to breed in:

Suburban trees (The Big 5 problem trees):

- 1. Boxelder (Maple) Acer negundo
- 2. English Oak Quercus robur var. hybridus
- 3. London plane Platanus X hispanica
- 4. Sweetgum Liquidambar styraxiflua
- 5. Black wattle Acacia mearnsii

Other plants:

Castor bean - Ricunus comminus

Agricultural orchard crops:

• Avocado, almonds, pear, peach, pecan & plums

Acer negundo - Boxelder is a sentinel for new infestations, the so called Canary in the cage. Start looking here!





Acer negundo flowers



Pecan (wet spot)

London plane (first sap flow, raised lesion after 6 months, eventually callus)

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Identifying Signs and Symptoms of PSHB Attack and **Fusarium Dieback (FD) in Trees**

can be difficult to find and identify them.

the tree is infested with PSHB-FD.

- Because PSHB are tiny beetles that spend 98% of their lives inside the tree, it
- However, infested trees show signs and symptoms that can help us determine if



Beetle Entry Hole

pen

Signs of Infection

gallery

brown to black staining

- The typical entry hole to an PSHB gallery is perfectly round and about 0.85 mm in diameter, or about the size of the tip of a ballpoint pen
- Entry hole and scale about the size of the tip of a medium ball-point

- Fusarium causes dark discolouration of the wood around the beetle
- Lightly scraping away bark from around the entry hole will reveal dark



Branch Dieback

Advanced infestations lead to branch dieback and overall decline. Watch for beetle attacks concentrated on a branch or branch collar. Infestations in this area can lead to limb failure.

Abiotic injury to trees

of damage by producing staining, gumming, or exudate.

Examples of these are: pruning cuts, injection sites, staples, nails and other mechanical damage

- Some trees respond to PSHB attacks the same way that they react to other kinds



Education & outreach

Getting the message out

- 1. Dedicated portal to report possible PSHB to managing agency with feedback loop through your Early Detection and Rapid Response (EDRR).
- 2. Communicate the risk of PSHB to the public and enlist their help
- 3. Develop targeted handouts for:
 - Parks, electricity, environment and solid waste employees
 - Garden services & tree workers
 - Fire wood vendors
 - Nurseries
 - Green waste handers and transporters



Green waste as pathway for the PSHB spread **Unprocessed: Green-waste & firewood**

Has not undergone a mechanical procedure to lessen or eliminate the pest risk.

This poses risk through facilitated spread when moved.

Always cover loads in transport.



Processed **Green-waste**

pest risk.

Mulch

- Chipped, ground or shredded
- Not completely processed
- It's movement poses a pest risk
- Recommend it remain in infestation area.
- Cover loads in transit

Has undergone a primary mechanical procedure to lessen or eliminate the

Compost

Completely processed

- No longer poses a pest risk
- Safe to move outside an infestation area
- Transporter/Hauler verification
- Green Waste should be:
 - covered
 - processed immediately
 - added to active compost within 72 hs
- Temperature requirements 50*c (15days) 5> turns

Surveillance/monitoring for early detection

- Early detection & Rapid response (EDRR) is key to controlling **PSHB**
- Visual detection in early stages can be difficult- entry holes <1mm diameter
- Chemical lures and trapping are therefore useful for monitoring
- <u>Surveillance serves to:</u>
 - act as an early warning system to identify new infestations delineate the source of new infestations

 - monitoring the spread
 - reduce infestation pressure

Monitoring and surveillance

- The chemical lure quercivorol is used for monitoring purposes which attracts the female beetle to the trap.
- PSHB are intercepted in traps 6 months before symptoms are visible in trees. <u>Where to start visual monitoring and trap deployment locations:</u>

- High density of reproductive host species
- Parks department depots
- Braai areas in recreation areas
- Green waste handling facilities and transporters
- Nurseries and mature tree handlers
- Water courses with high densities of reproductive host species



Lessons for California

- 1. Prioritise surveying
- 2. Actively manage tree inventories
- 3. Ensure continuity of irrigation
- 4. Trap in multiple and static sites to determine the trends
- 6. Standardise criteria to determine when the best time is to:
 - Monitor
 - Treat
 - Remove

7. Remove amplifier trees >150 holes



5. Timing treatments is important (yearly drenching or numerous basal sprays)

ISHB management matrix in California

FD – ISHB Management Matrix - Infested Urban and Peri-urban Forest

Host Type	Hazard Level ¹	No Infestation	Low	Moderate I	Moderate II	Heavy
Reproductive Host	Low	Monitor	Monitor & Spot Inject	Monitor ² Remove Actively Infested Branches	Monitor ² Remove Actively Infested Branches	Remove Actively Infeste Tree ² & Stump
	High	Monitor	Monitor & Remove Hazard Branches	Monitor ² Remove Hazard Branches	Remove Hazard Branches, or Remove Tree & Stump	Remove Tree ² & Stump
Non- Reproductive Host	Low	Monitor	Monitor	Notify UC ANR; consult with FD – ISHB experts to determine if species is a new reproductive host		
	High	Monitor	Monitor			
	Host Type Reproductive Host	Host TypeHazard Level1Reproductive HostLowHighNon- Reproductive HostLowHigh	Host TypeHazard Level1No InfestationReproductive HostLowMonitorHighMonitorNon- Reproductive HostLowMonitorNon- Reproductive HostLowMonitor	Host TypeHazard Level1No InfestationLowReproductive HostLowMonitor& & Spot InjectHighMonitorMonitor & MonitorMonitor & Remove Hazard BranchesNon- Reproductive HostLowMonitorMonitorNon- Reproductive HostLowMonitorMonitor	Host TypeHazard Level1No InfestationLowModerate IReproductive HostLowMonitorMonitor2 & Spot InjectMonitor2 Remove Actively Infested BranchesHighMonitorMonitor MonitorMonitor2 Remove Hazard BranchesNon- Reproductive HostLowMonitorMonitor2 Remove Hazard BranchesNon- Reproductive HostLowMonitorMonitorNon- HighMonitorMonitorMonitorHighMonitorMonitorMonitor	Host TypeHazard Level1No InfestationLowModerate IModerate IIReproductive HostLowMonitorMonitor & Spot InjectMonitor2 Remove Actively Infested BranchesMonitor2 Remove Actively Infested BranchesMonitor2 Remove Actively Infested BranchesNon- Reproductive HostLowMonitorMonitor & Remove Hazard BranchesMonitor2 Remove Hazard BranchesRemove Hazard Branches or Remove Tree & StumpNon- Reproductive HostLowMonitorMonitorMonitorNon- Reproductive HostLowMonitorMonitorNon- Reproductive HostMonitorMonitorMonitor

HIGH VALUE TREES ¹	Host Type	Hazard Level ¹	No Infestation	Low	Moderate I	Moderate II	Heavy
	Reproductive Host	Low	Monitor	Treat/Remove Infested Branches ³	Treat/Remove Actively Infested Branches ³	Treat/Remove Actively Infested Branches ^{2,3}	Remove Activel Infested Tree ² & St
		High	Monitor	Treat/Remove Hazard Branches ³	Treat/Remove Hazard Branches ³	Remove Infested Branches, or Tree ² & Stump	Remove Tree ² & St
	Non- Reproductive Host	Low	Monitor	Monitor	Notify UC ANR; consult with FD – ISHB experts to determine if species is a new reproductive host		
		High	Monitor	Monitor			

ISHB Infestation Level & Management Options

ISHB Infestation Level & Management Options



Infestation attack management Tool Box

Infestation Levels (Number of entry holes observed)

LOW **Moderate** I Moderate II Heavy **Amplifier tree**

< 50 >50 and <150</p> >150 >150 + dieback >150 - REMOVE

Chemical treatments (Not yet registered in ZA)

- Treatments are expensive, time consuming to apply on individual tree basis and require specialist equipment
- Basal sprays are hazardous in public recreation areas
- Injecting trees can cause to damage and secondary infections especially in Platanus and Quercus species
- Soil drenching could result in to ground water contamination
- Negative environmental impacts are a concern
- Only offer short term protection, need to be reapplied over time
- Pesticides can not be relied on as the sole management option
- Currently no proven insecticide registered for use against PSHB in South Africa
- Therefore it is recommended that amplifier tree (>150 + holes) be removed

Tree removal

Biosecurity measures for handling PSHB infested green waste

- Remove amplifier trees in winter when PSHB is least active
- Chipping to <25mm results in 98% death of PSHB
- Cover chipped green waste with clear plastic
- •Wood to large to chip needs to be covered with clear plastic
- Cover for 6 weeks in summer
- Cover for 6 months in winter
- Tree stump cut to the ground and covered with black plastic

Transport Biosecurity measures for transporting PSHB infested green waste

- •Fully enclosed vehicle or properly covered loads
- Only move green waste to an approved receiver
- Direct route / use of highways
- Transport equipment biosecurity measures to be instituted
- Spill notification and response
- Compliance monitoring
- •Cover loads in transit.

Biosecurity measures for tree workers

- To limit the spread of PSHB infested green waste, one can institute:
- 1. Always cover green waste material during transport
- 2. Prioritise chipping of green waste into fully enclosed closed truck bodies if possible
- 3. Transport material to green waste handling facilities, preferably in an infested area
- 4. Use dedicated routes and monitor them often
- 5. Institute daily vehicle & equipment cleaning protocols
- 6. Do not allow staff to keep or take firewood to or from yards

Take away points so far.

Doing nothing is not an option, the longer one leaves it, the more trees one will loose, therefore consider taking the following steps:

- 1. Treatment is not an option at present and illegal under Act 36 of 1947
- 2. Establish a dedicated reporting portal
- 3. Developing handout material for role players
- 4. Enlisting the help of the public to monitor for infestations
- 5. Monitoring and trap deployment is a good investment
- 6. Managing green waste effectively can benefit reforestation
- 7. Tree removal is inevitable to avoid risk, one can start with limbs
- 8. Removing amplifier trees)>150+ holes) first is the best method to reduce PSHB pressure in a location

Alternative disposal

Ways to add value to biomass generate from tree removals:

- 1. Solarisation of chip under clear plastic
- 2. Solarisation of wood under clear plastic
- 3. Composting of the green waste
- 4. Pelletising wood chip for heating
- 5. Clean energy generation with biomass.
- 6. Alternative day covering at landfill

Replanting the urban landscape

Restoring a more diverse and robust ecosystem:

- 1. Replant with a diversity of species
- 3. Only plant if irrigation is available
- 4. Use healthy plant material
- 5. Practice good arboriculture
- 6. Reduce abiotic impact
- 7. Continuously monitor plantings

2. The reproductive host species list is not a do not plant list (exclude "Big 5")

Preventative measures for live plants Source from a reputable supplier that has a verified clean bill of health

- tree species you are planting
- Each plants history should be traceable
 - retained
- Inspect trees prior to planting, ideally on delivery
- Implement regular inspection of newly planted trees

Be aware of signs and life stages of pests and pathogens that can affect the

Records of tree purchases, planting locations and monitoring should be

Opportunities

How we can benefit from PSHB

- 1. Manage tree inventories better
- 2. Understand pests and pathogens affect on trees
- 3. Develop professional tree maintenance teams
- 4. Improve green waste handling capacity and infrastructure
- 5. Have improved access to compost and safe chip/mulch
- 6. Develop stronger relationships with the public and other managing authorities
- 7. Establishment of robust and diverse plantings

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