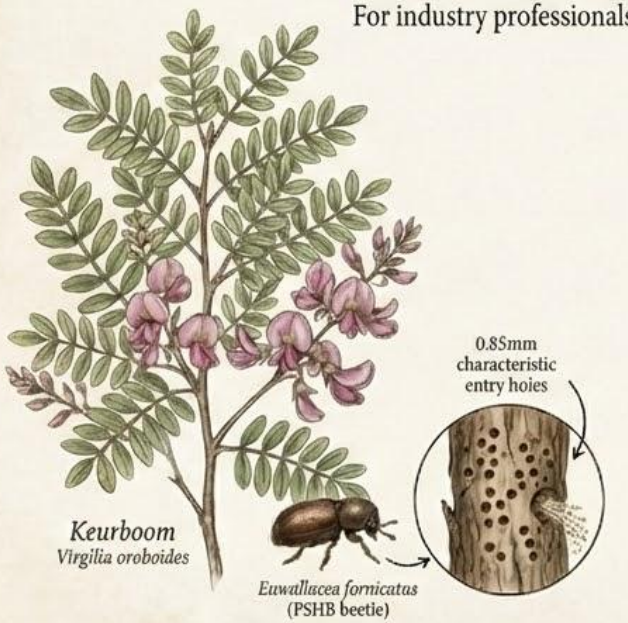
HAPPY BY NATURE

Nature Conversations

Polyphagous Shot Hole Borer (PSHB)

What is happening in Cape Town. Practical, Collaborative Solutions.

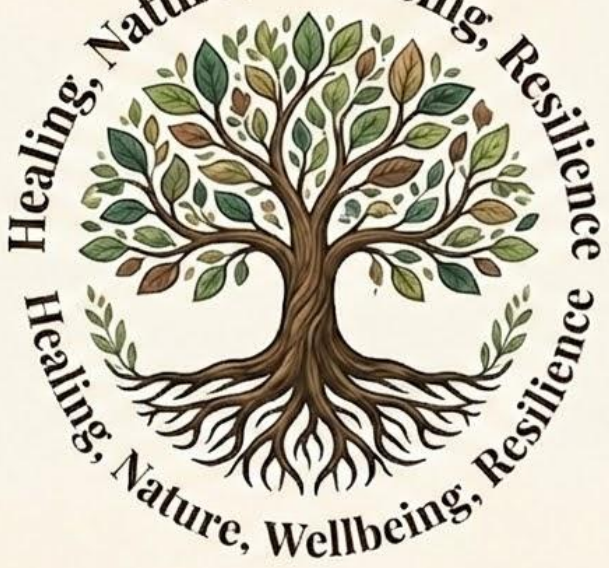
For industry professionals only. Arborists, Horticulturists, Landscapers, Conservationists, etc.



Welcome & What to Expect

Our intention -
Nature conversations
to remember our true nature

Green Professionals
co-creating with Nature
to nurture wellbeing



PSHB Overview
biology, timeline, diagnosis,
management, resources

PSHB Discussion
observations, challenges,
opportunities, collaborations

The Beetle: Tiny but Mighty (*Euwallacea fornicatus*)

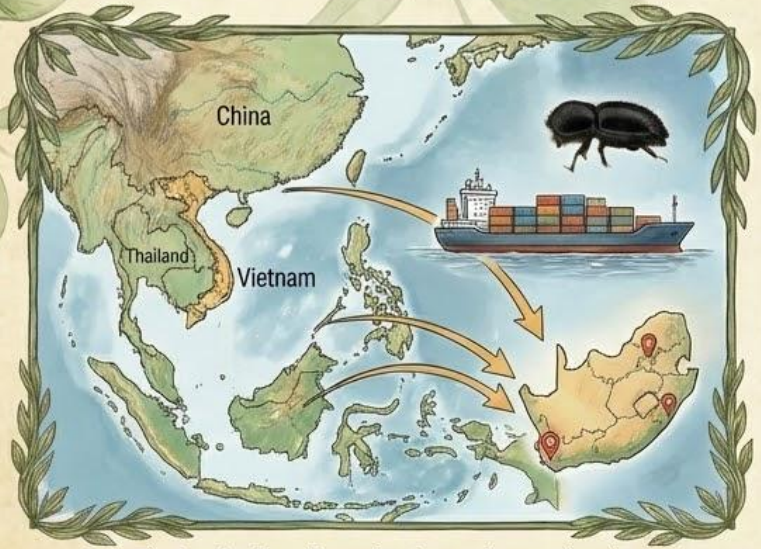
Actual Size
(approx. 2mm)

Magnified View
(Female)

Polyphagous Shot
Hole Borer

Timeline

1. Origins: The Southeast Asian Connection



- The beetle, *Euwallacea fornicatus*, is an ambrosia beetle native to Southeast Asia (Vietnam, China, Thailand).
- **Genetic Tracing:** DNA barcoding confirms H33 haplotype (California, Israel) and H38 (suggesting multiple introductions from Vietnam/China).
- **Vector of Arrival:** Likely entered SA via global trade routes, accidentally imported in infested wood packaging material (dunnage) or pallets.

2. The Timeline of Invasion: A 'Silent' Establishment

Intro: The beetle was here long before noticed ('cryptic establishment').

2012
The 'Silent' Arrival (KZN)
Retroactive DNA testing confirmed PSHB presence in Durban. 5-year head start.

2017
The Official Discovery (Pietermaritzburg)
"Patient Zero" on London Plane trees in KZN Botanical Gardens. FABI launched national monitoring.

2018
The Northern Expansion (Gauteng & Northern Cape)
Exploded into Johannesburg (Sandton) and Northern Cape. Threat to Pecan nut industry.

2019
The Western Cape Breach (Somerset West)
First confirmed infestation in Western Cape, likely via infested firewood.

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2021–2022
National Saturation
Confirmed in 8 of 9 provinces. Largest geographical outbreak of this species globally.

2023
The Southern Suburbs Breach
Confirmed in Cape Town Southern Suburbs. End of 'lag phase', beginning of exponential growth.

2024–2025
Current Status (The Peninsula Crisis)
Moved into City Bowl and Hout Bay. Over 7,000 infested trees identified in Cape Town. Threatens indigenous forests.

The “Double Threat”: Obligate Symbiosis

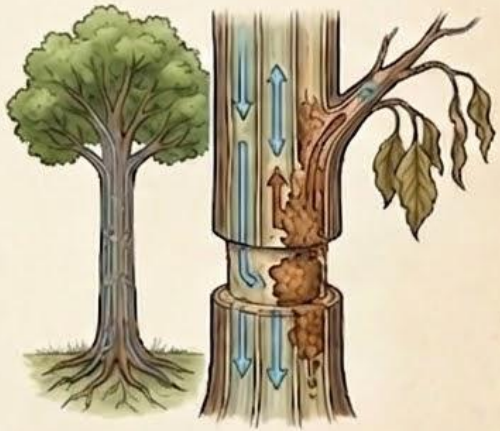
PSHB is not just an insect pest; it is a pest-disease complex.

Fungus Farming

The beetle (*Euwallacea fornicatus*) is a farmer, not a wood-eater. Females carry fungal spores in specialized mycangia.

The Pathogen

The fungus, *Fusarium euwallaceae*, grows in the tree's vascular tissue (xylem), serving as the sole food source.



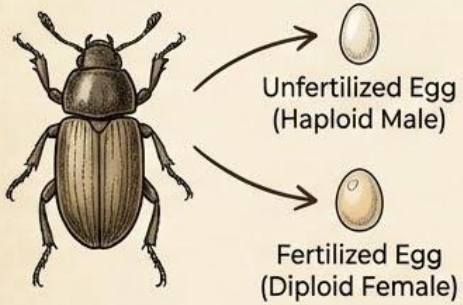
The Mechanism of Death

Fungus invades the vascular system, blocking water and nutrient transport, causing Fusarium Dieback. Stops both beetle and fungus deep in the wood.

The "Perfect Invader": Reproductive Strategy

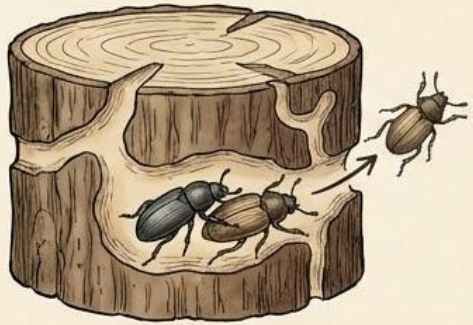
Why is the spread so explosive? The beetle has a reproductive strategy called **haplodiploidy** combined with extreme inbreeding.

Single Founder Event



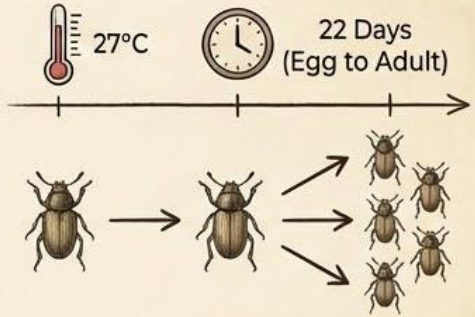
A female can lay unfertilized eggs which develop into haploid males. She then mates with these males to produce diploid females.

Sibling Mating



The flightless males stay inside the tree and mate with their sisters (the new females) before the females leave the gallery. A single unmated female can start a new colony.

Explosive Growth

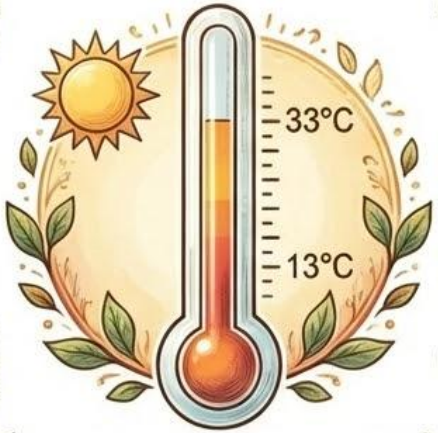


In optimal temperatures (around 27°C), the life cycle takes only 22 days. A single female can produce over 30 offspring, leading to exponential population growth in one season.

Climate and Dispersal

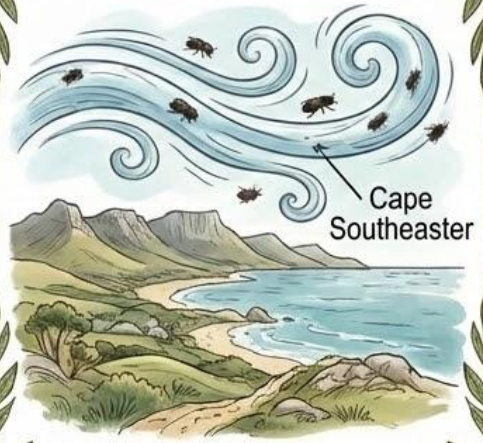
Given our location in the Western Cape, we need to understand the local dispersal dynamics.

Temperature Sensitivity



Most active between 13°C and 33°C. Peak dispersal in Cape late summer/autumn; can continue on warm winter days.

The ‘Cape Doctor’

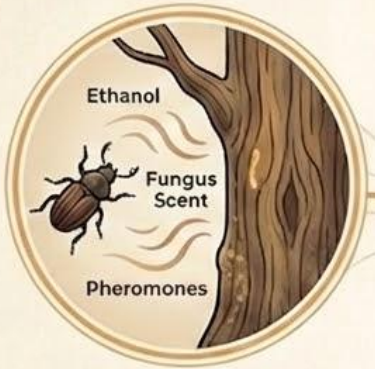


Strong winds (Cape Southeaster) accelerate spread over short distances (30m–400m), carrying beetles from suburbs to the City Bowl.

Human Vectors

Beetle (2mm, size of a sesame seed) is easily transported in firewood, nursery stock, and green waste. Primary driver of long-distance spread.

Finding a Host Tree



It Smells Them

Attracted to stress signals of trees (ethanol), scent of symbiotic fungus in colonised trees, aggregation pheromones from females in reproductive host trees.

It Sees Them

Drawn to the dark silhouettes of large trunks (Visual Cues).

It Tests Them

Bores into the bark to test suitability.

Result: Non-Reproductive Host

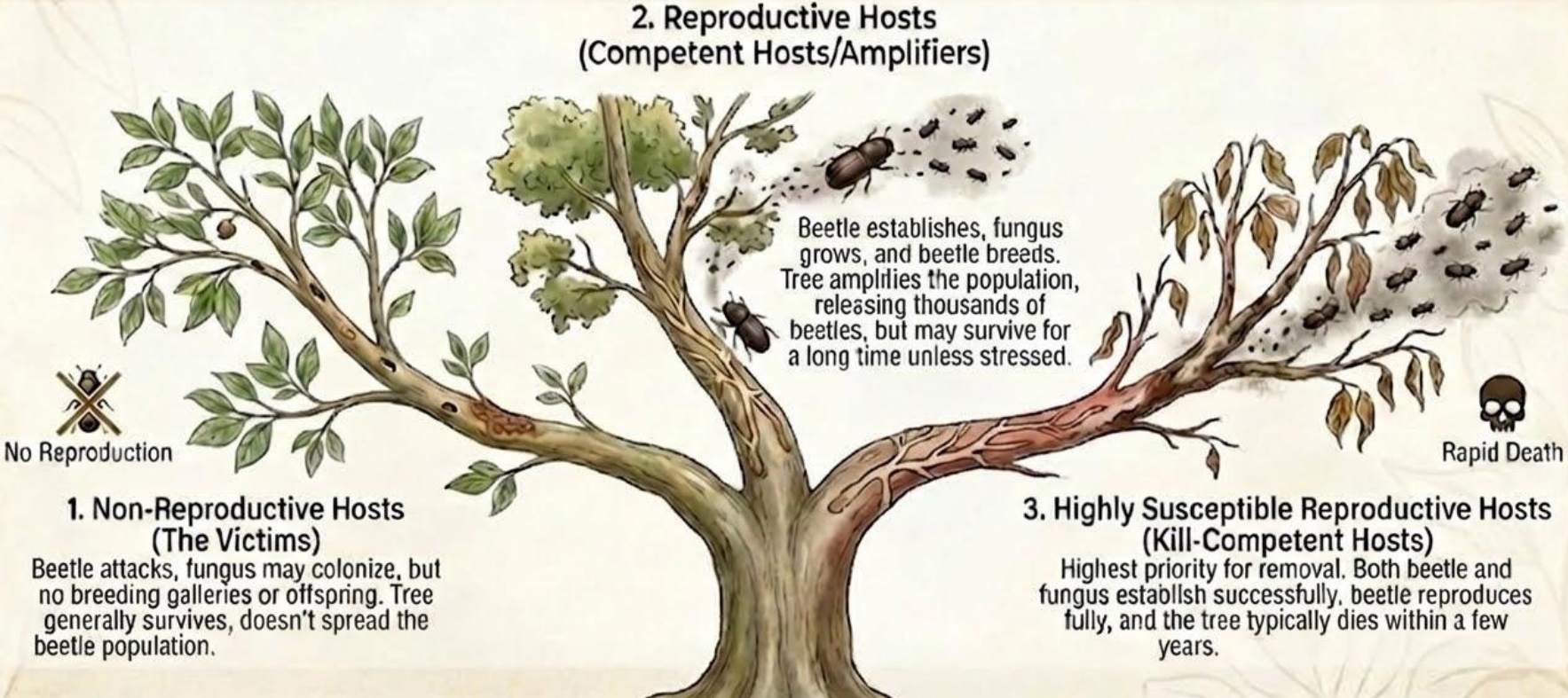
"Shotgun" damage on non-hosts (beetle rejects tree, but fungus stays).

Result: Reproductive Host (Colonization)

Colonization of reproductive hosts (beetle stays and breeds).

Host Types: The “Polyphagous” Factor

The beetle attacks hundreds of tree species, but the outcome differs, dividing host trees into three categories based on the beetle’s reproductive success and the tree’s fate.



Highly Susceptible **Exotic Reproductive Hosts**

These trees are the engines of the invasion in Cape Town. The beetle breeds freely in them, and the fungus kills them rapidly. They are “Super Spreaders.”

Acer negundo (Box Elder)

The single most dangerous tree. Zero resistance. A 'beetle factory' amplifying populations that spill into indigenous trees.

Quercus robur (English Oak)

The tragedy of our heritage avenues. Dies rapidly (3–5 years) after infestation. Becomes structurally brittle and dangerous.

Salix babylonica (Weeping Willow)

Highly susceptible. Found along Cape waterways, acting as a corridor for the beetle to move into riverine systems.

Ricinus communis (Castor Bean)

A Category 2 invasive weed. A highly effective reproductive host that often goes unnoticed in disturbed areas.

Highly Susceptible Indigenous Reproductive Hosts

Virgilia oroboides, V. lanceolata & V. divaricata
(Keurboom)

Salix mucronata
(Cape Willow / Umngcunube)

Erythrina caffra
(Coast Coral Tree)

Podalyria calyptrata
(Water Blossom Pea)

Diospyros glabra
(Cape Star-apple)

Trichilia emetica
(Natal mahogany)

Ficus trichopoda
(Swamp Fig)

Sparmannia africana
(African Hemp)

Dais cotinifolia
(Pompom Tree)

Searsia henningsii
(Forest Wild Currant)

Combretum kraussii
(Forest bushwillow)

Exotic Reproductive Hosts

The "Amplifier" List (Do Not Plant) In these trees, the beetle successfully breeds and the fungus establishes. The tree may not die immediately (acting as a long-term reservoir) or may die slowly. These should be phased out of Cape Town landscapes.

Maples & Planes:

- Platanus x acerifolia (London Plane): Critical Note: While sometimes listed as just "reproductive," in the Western Cape urban context, these are heavily impacted and act as major reservoirs. About 50% of infested Planes in George/Somerset West are in decline.
- Acer buergerianum (Chinese/Trident Maple)
- Acer palmatum (Japanese Maple)
- Acer saccharinum (Silver Maple)

Oaks:

- Quercus palustris (Pin Oak)
- Quercus suber (Cork Oak): Note: Often more resilient than English Oak, but still breeds the beetle.

Exotic Reproductive Hosts

Ornamentals & Others:

- *Liquidambar styraciflua* (American Sweetgum): Highly common in Cape Town suburbs; susceptible to dieback.
- *Magnolia grandiflora* (Southern Magnolia)
- *Ulmus parvifolia* (Chinese Elm)
- *Populus* spp.: Including *P. nigra* (Lombardy Poplar) and *P. alba* (White Poplar).

Invasive Aliens (Biomass Risks):

- *Acacia mearnsii* (Black Wattle)
- *Acacia melanoxylon* (Blackwood): This is a particular threat where urban edges meet Table Mountain National Park, as it bridges the gap to indigenous forests.

Agricultural/Fruit Trees:

- *Persea americana* (Avocado): This is a confirmed Reproductive Host. This poses a threat to backyard food gardens and the agricultural border of the city.
- *Prunus* spp.: Including *Prunus armeniaca* (Apricot) and *Prunus cerasifera* (Cherry Plum).

Other Indigenous Reproductive Hosts

Afrocarpus falcatus
(Outeniqua Yellowwood)

Kiggelaria africana
(Wild Peach)

Calodendrum capense
(Cape Chestnut)

Combretum erythrophyllum
(River Bushwillow)

Harpephyllum caffrum
(Wild Plum)

Combretum kraussii
(Forest Bushwillow)

Cussonia spicata
(Cabbage Tree)

Vepris lanceolata
(White Ironwood)

Halleria lucida
(Tree Fuchsia)

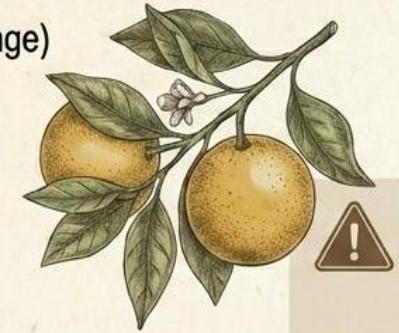
Sparmannia africana
(African Hemp)

Exotic Non-Reproductive Hosts

The beetle attacks these trees (showing holes), and the fungus may establish (causing staining or branch dieback), but the beetle cannot successfully breed. The tree is a "dead-end" host. These trees generally survive but require care.

Common Cape Town Garden Trees:

- *Jacaranda mimosifolia* (Jacaranda): Attacked, but does not breed beetles.
- *Citrus* spp. (Lemon and Orange)
- *Ficus carica* (Common Fig)
- *Bougainvillea* spp.
- *Hibiscus rosa-sinensis*
- *Camellia japonica*
- *Plumeria rubra* (Frangipani)



Landscape & Street Trees:

- *Eucalyptus camaldulensis* (River Red Gum)
- *Betula pendula* (Silver Birch)
- *Fraxinus* spp. (American and European Ash)
- *Taxodium distichum* (Swamp Cypress)

Strategic Note:
Plane Tree species distinction is critical fo mis critical for management:

- *Platanus x acerifolia* (London Plane) = Reproductive Host (High Risk).
- *Platanus occidentalis* (American Plane) = Non-Reproductive Host (Lower Risk).
- *Platanus racemosa* (Californian Plane) = Non-Reproductive Host (Lower Risk).

Misidentification risks incorrect management decisions.

Indigenous Non-Reproductive Hosts

Celtis africana
(White Stinkwood)

Adansonia digitata
(Baobab)

Vachellia karroo
(Sweet Thorn)

Vachellia sieberiana
(Paperbark Thorn)

Searsia lancea
(Karee)

Buddleja saligna
(False Olive)

Nuxia floribunda
(Forest Elder)

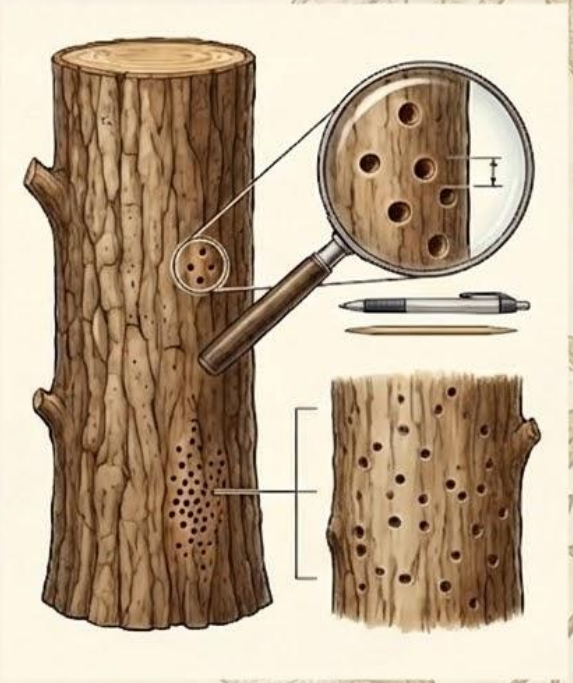
Olea europaea subsp. *africana*
(Wild Olive)

Podocarpus henkelii
(Henkel's Yellowwood)

Searsia chirindensis
(Red Currant)

The Entry Hole

- **Description:** Perfectly round holes, approximately 0.85 mm to 1 mm in diameter.
- **Field Visual:** roughly the size of the tip of a medium ballpoint pen or a toothpick.
- **Location:** Holes penetrate directly through the bark into the sapwood. They are often located on the main trunk and large branches.
- **‘Shotgun’ Pattern:** In heavily infested trees, you will see a multitude of these holes concentrated in specific areas, resembling the pattern of a shotgun blast.



TREE'S EXTERNAL DEFENSE RESPONSES

GUMMING (RESINOSIS):
Resin oozing from entry holes. Tree's active attempt to trap the beetle.

SUGAR FOUNTAINS (SUGAR VOLCANOES):
White, powdery, or crystalline sugary exudates. Often looks like a small volcano or dried white stain.

WET STAINING / OILY SPOTS:
Dark, "greasy," or water-soaked patches. No thick gum, just wet discoloration.

FRASS:
Fine wood powder and excrement. Powder collecting in bark crevices or at the base.

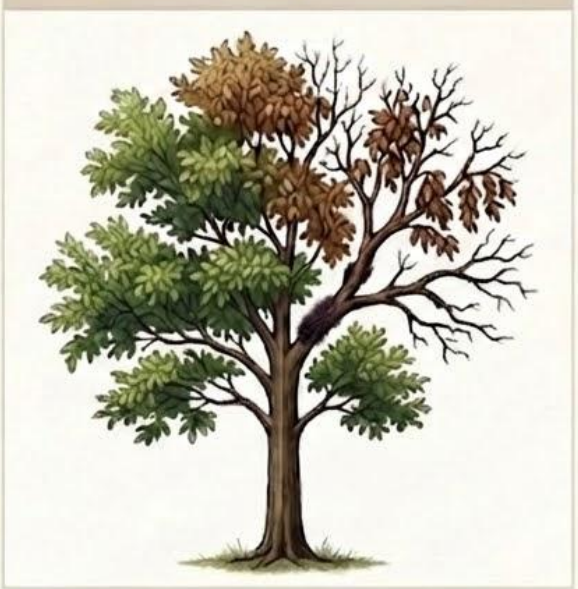
NOODLES:
Frass compacted into thin tubes or "noodles" that stick out of the hole.

The Internal Lesions & Consequences

Internal Staining

A brown, black, or pinkish stain in the sapwood (xylem) surrounding the tunnel.

Fusarium Dieback



The gradual or rapid death of specific branches.

Branch Breakage

Heavily infested branches become structurally weak due to the honeycomb of galleries and dry wood.

Toothpick Test

PERFORMING THE TEST

1. Locate the Hole:
Find a suspicious round entry hole on the trunk or branch.

2. Expose the Sapwood:
Use a chisel or knife to carefully peel back a small square of bark around the hole. You need to see the hole entering the actual wood (xylem), not just the bark.

3. Insert the Toothpick:
Take a standard round wooden toothpick and gently insert it into the hole as far as it will go without forcing it.

INTERPRETING THE RESULTS

1. The 'Tip-Only' (1/3 Insertion): *Xyleborus perforans*

- **Result:** The toothpick only goes in about one-third of the way up the taper before getting stuck.
- **Diagnosis:** This is likely the indigenous Xyleborus perforans (or a similar native species).
- **Context:** This beetle typically targets trees that are already sick or stressed. You will often see a distinct purple stain around the hole. This is not the PSHB crisis beetle.

⚠ CAUTION

2. The "Snug Fit" (2/3 Insertion): *PSHB (Euwallacea fornicatus)*

- **Result:** The toothpick gets in about two-thirds of the way up the taper. It fits snugly, like a key in a lock.
- **Diagnosis:** This is the Polyphagous Shot Hole Borer.
- **Context:** PSHB is one of the few beetles that attacks healthy, green wood. If you see this hit on a living tree, combined with symptoms like wet staining or sugar volcanoes, you should treat it as a positive sighting.

3. The "Loose Fit" (Full Insertion): *Platypodinae*

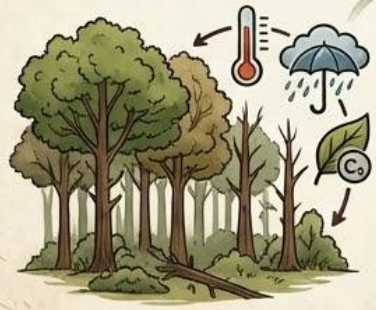
- **Result:** The toothpick slides all the way in, past the taper, or feels loose.
- **Diagnosis:** This is likely a Platypodinae beetle (another indigenous group).
- **Context:** These beetles generally attack timber that is already dead or severely weakened. If the toothpick falls right in, it is likely not PSHB.

Economic Cost

The Polyphagous Shot-Hole Borer (PSHB) beetle-fungus complex is a major economic threat to South Africa, with an estimated net present cost over the next decade.

Municipal/Residential:
High costs for removing and disposing of dead urban trees; up to 65 million urban trees (a quarter of SA's total) are at risk.

Agricultural Losses:
PSHB damages high-value crops (avocado, macadamia, pecan), causing reduced yields and higher management costs.



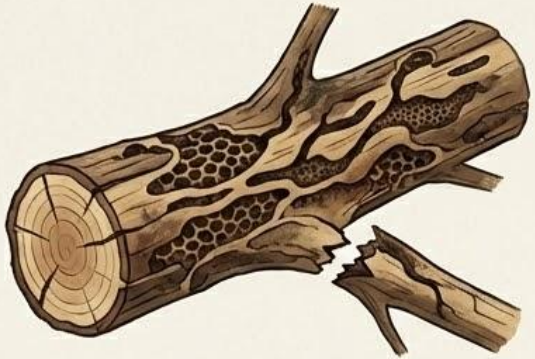
Ecosystem Services:
Loss of millions of trees degrades essential services like carbon sequestration, stormwater management, and climate regulation, leading to higher urban temperatures and poorer air quality.

Property Value & Tourism:
The death of iconic and historic trees (e.g., English Oaks) decreases property values and harms the aesthetic and ecological value crucial for the tourism industry, particularly in the Garden Route.

Physical Safety Issues

For arborists and municipal managers, this is the immediate liability concern. PSHB does not just kill trees; it compromises their structural integrity rapidly.

Structural Collapse:



Traffic and Infrastructure Risks:

The 'Brittle' Factor:

Structural Collapse:

PSHB galleries honeycomb the wood, and the fungal symbiont causes necrosis. This weakens branches and stems, making them prone to snapping, even before the tree looks completely dead.

Traffic and Infrastructure Risks:

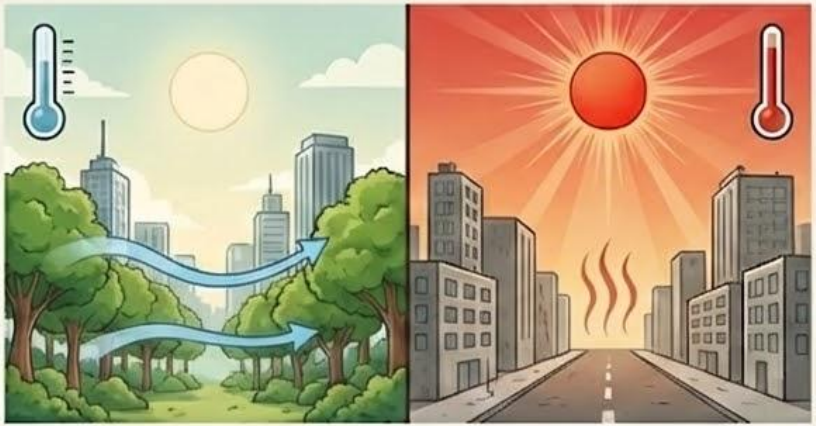
Heavily infested trees, particularly large urban species like English Oaks and London Planes, pose a direct threat to road users, pedestrians, and property (buildings, fences, power lines).

Specific species, such as the **English Oak** (*Quercus robur*) and **Coral Tree** (*Erythrina caffra*), become notoriously brittle and dangerous to climb or rig down once infested, posing a severe occupational health and safety risk to tree workers.

Public Health Impact

Trees are essential to public health infrastructure; widespread removal will degrade urban environments.

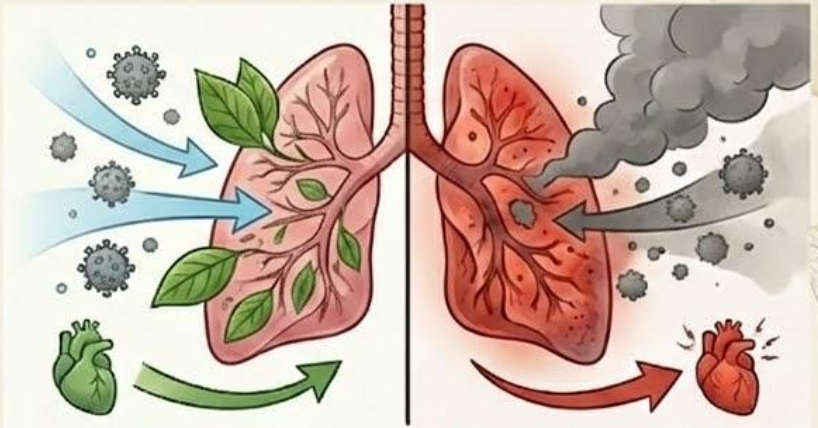
Urban Heat Island Effect:



Urban Heat Island Effect:

Loss of canopy increases localized temperatures, intensifying heat stress for residents, especially in vulnerable communities.

Respiratory & Cardiovascular Health:



Respiratory & Cardiovascular Health:

The death of urban trees (due to pest invasions) is linked to increased human mortality from cardiovascular and respiratory illnesses. Trees filter pollution; losing them removes this natural defense in urban/industrial areas.

Psychological & Social Impact

Solastalgia:

This term describes the distress caused by environmental change. The removal of thousands of heritage trees (like the avenues of Stellenbosch or Somerset West) alters the “sense of place” and aesthetic value of neighborhoods, leading to a decline in emotional wellbeing for residents.

Loss of Recreation:

Parks and greenbelts are essential for de-stressing. The closure of these areas for tree felling, or the loss of the canopy that makes them usable in summer, directly impacts the mental health benefits derived from urban green spaces.

Traditional Health Impact

For many South Africans, trees transcend mere landscaping; they are vital medicine and spiritual anchors, making the PSHB invasion a “biocultural crisis”.

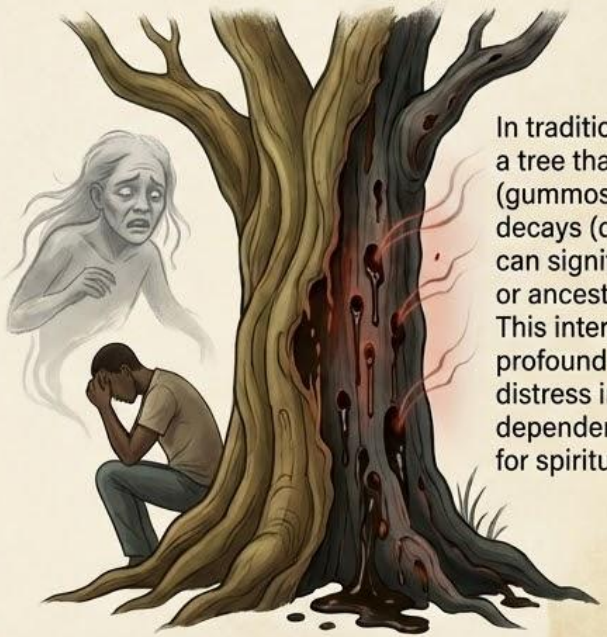
Loss of Medicinal Resources:

***Virgilia oroboides* (Keurboom):**
Traditionally used for internal tumors and mental health. Its disappearance means losing a restorative agent for psychological well-being.

***Salix mucronata* (Cape Willow):**
A primary source of “cooling” medicine (salicin) for fevers and rheumatism. The tree's death is symbolically interpreted as a “heating up” of the environment, both literally and spiritually.

***Kiggelaria africana* (Wild Peach):**
Traditionally viewed as a protector of the homestead (kraal). Infestation is seen as a breach of these protective spiritual shields.

Spiritual and Psychological Distress:

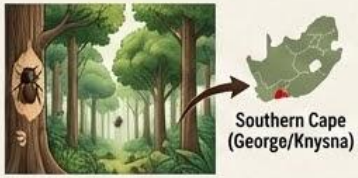


In traditional cosmology, a tree that “bleeds” (gummosis) or internally decays (due to the borer) can signify spiritual pollution or ancestral displeasure. This interpretation causes profound psychological distress in communities dependent on these trees for spiritual hygiene.

Forest Impact

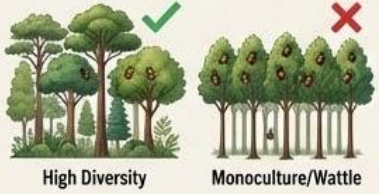
The Polyphagous Shot-Hole Borer (PSHB) threat has expanded beyond urban areas, now actively invading Afrotemperate Forests.

Ecological Consequences of PSHB Invasion:



Invasion of Natural Forests:

Research (Townsend et al., 2025) confirms PSHB has successfully penetrated natural forests in the Southern Cape (George/Knysna), rather than remaining confined to the edges.

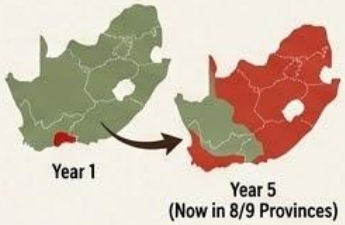


The 'Dilution Effect':

A critical insight is that species-rich indigenous forests demonstrate lower PSHB attack rates, suggesting that diversity acts as a buffer. Conversely, monocultures, such as invasive Wattle stands, intensify the pest problem.

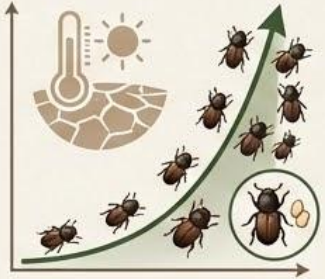
Keystone Species Loss and Ripple Effects:

The mortality of foundational species like *Virgilia* (a nitrogen-fixing pioneer) and *Erythrina caffra* is particularly alarming. These trees are crucial for the structure of coastal and fynbos-adjacent forest ecosystems. Their loss creates significant canopy gaps, which increases the risk of successful establishment by alien invasive plants, disrupting the entire trajectory of post-fire forest recovery.



The Trajectory of the Invasion:

Five years of monitoring data indicate that South Africa is still in the early phases of the PSHB invasion. As the beetle adapts to more indigenous hosts and continues to spread geographically (it is now present in eight of nine provinces), the ecological damage is projected to escalate.



Risk of Exponential Spread:

Researchers caution that PSHB populations are capable of exponential growth, mirroring trends observed in earlier invasions in California and Israel.

The dispersal threat is high because a single female can initiate a new colony. This means every successful dispersal event, whether natural or human-mediated, can trigger a new local outbreak.

The threat is compounded in indigenous forests already weakened by climate change, as trees stressed by drought or heat are more susceptible to ambrosia beetle attacks.

Biosecurity options

Closing the 'Human Vector' – "What happens on site, stays on site"

Source Hygiene ("Start Clean")

- **Buy Where You Burn**
  for hame healthy sapling
- **Nursery Quarantine**
  Avoid infested zones
- **The '2.5cm Rule'**
  means mature risk vect

Operational Hygiene ("Work Clean")

- **Sterilization:** Tools & clothing
- Vehicles & chippers cleaned

Come Clean, Go Clean

Waste Logistics ("End Clean")

- **Covered Transport**
- Chip it Small (<2.5cm)
- Solarization (>=6 weeks)

The Legal Imperative

- Biosecurity is a legal requirement
- PSHB is a quarantine pest
- Reputational and legal liability

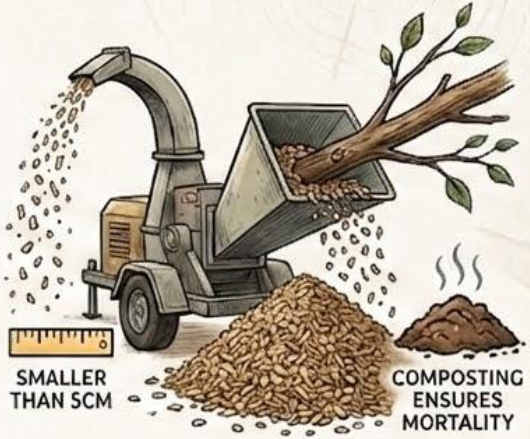
Mechanical Options

Pruning and Removal

Targeted removal of infested branches or entire amplifier trees. Most effective way to reduce the local beetle population; requires careful disposal to avoid spreading the pest.

Solarization

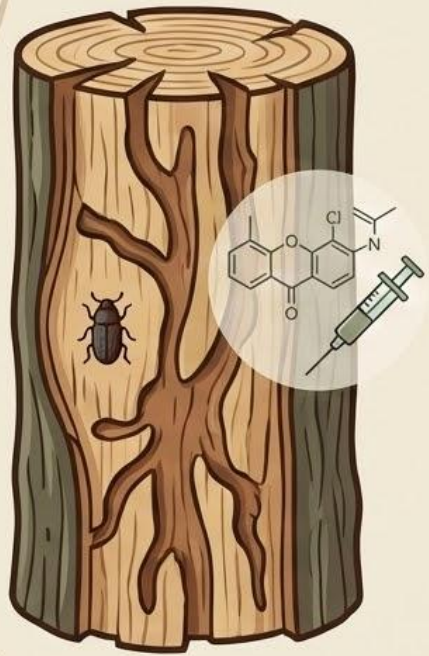
Sealing wood under heavy-duty clear plastic in direct sunlight for 1–6 months. Heat generated kills beetles and fungi; highly effective for on-site treatment.



Chipping

Reducing wood to chips smaller than 5cm. Destroys the integrity of the galleries; composting the chips further ensures beetle mortality.

Chemical Options



Chemicals: Pesticides & Antifungals (e.g., bifenthrin, emamectin benzoate, propiconazole).

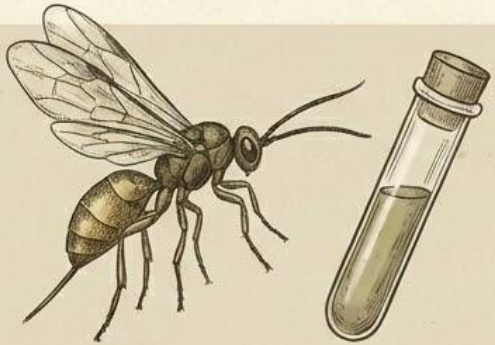
Methods: Trunk injections or sprays.

Only partially effective (reduction in colonization); expensive; generally reserved for early stage & high-value ornamental specimens.

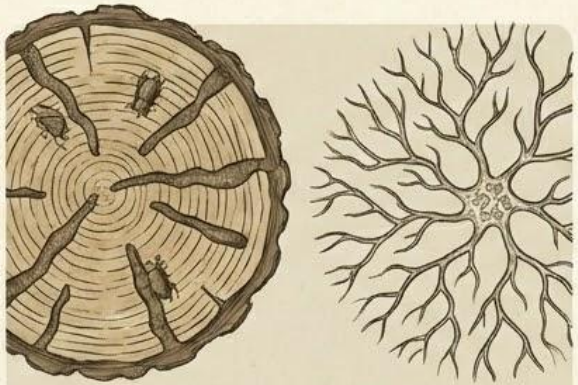
Challenge: PSHB lives deep within wood, often beyond reach of systemic treatments that rely on compromised vascular system.

Regulation: No pesticides specifically registered for PSHB in South Africa; applications are experimental & require extreme caution regarding environmental impact.

Biological Options



- Status: Research is active (FABI, Stellenbosch, Rhodes), but NO agents are currently ready for release.
- Parasitoid wasps from Vietnam are being studied.



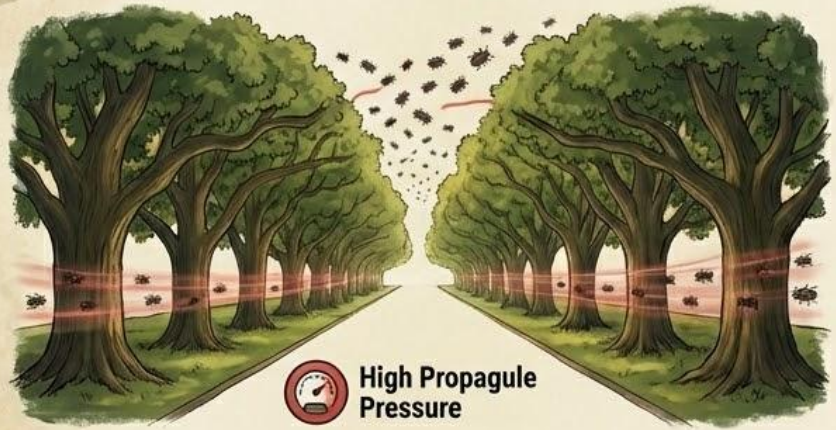
- “Good fungi” (biocontrols) struggle to reach beetles deep inside the wood.

- Biocontrol is a hope for the future (10+ years).

The Dilution Effect

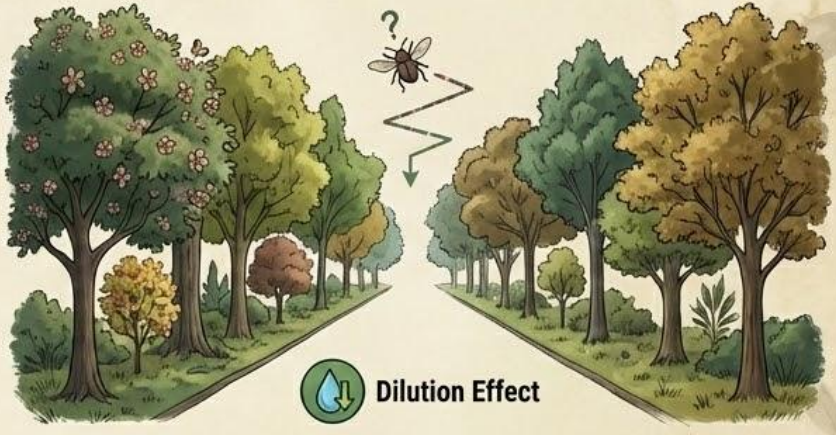
We are moving from “Avenues” to “Mosaics.”

The Problem: Monocultures (‘Avenues’)



Current urban forests are vulnerable due to monocultures. Streets lined entirely with single species (e.g., English Oaks, London Planes) act as “superhighways” for the beetle. High host density increases “propagule pressure”—a high beetle load leads to attacks on everything.

The Solution: Diversity (‘Mosaics’)



We must plant for diversity. Research confirms that higher tree species richness results in lower PSHB attack rates. By planting a mix of non-host or low-susceptibility indigenous species, we create a “dilution effect.” The beetle has to fly further to find a suitable host, reducing its breeding success.

The “Do Not Plant” List

We must stop planting “pest amplifiers.”

Strictly Prohibited: The “Big 5” Reproductive Hosts

1. English Oak (*Quercus robur*).
2. Box Elder (*Acer negundo*).
3. London Plane (*Platanus x acerifolia*).
4. Sweetgum (*Liquidambar styraciflua*).
5. Willow (*Salix exotic spp.*).

Amplifier Hosts

Indigenous Caution: Susceptible indigenous trees in high-load areas

While vital trees, planting them in a PSHB hotspot is currently a death sentence for the tree and helps the beetle breed.

Examples: Keurboom (*Virgilia oroboides*) & Cape Willow (*Salix mucronata*).

Avoid planting in high-load areas!

The “Safe to Plant” List

Currently Non-Reproductive species (beetle attacks but fails to breed).

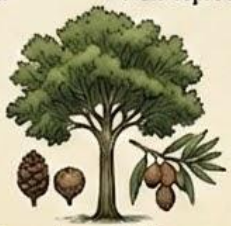
Indigenous Recommendations: Safer Bets for Cape Town

White Pear
(*Apodytes dimidiata*)

White Milkwood
(*Sideroxylon inerme*) – Resilient and coastal.

Cape Ash
(*Ekebergia capensis*) – Non-reproductive.

Wild Olive
(*Olea europaea* subsp. *africana*) – Generally non-reproductive/resilient, monitoring advised.



Outeniqua Yellowwood
(*Afrocarpus falcatus*) – Reproductive host, proceed with caution. (*Podocarpus henkelii* is currently listed as non-reproductive).

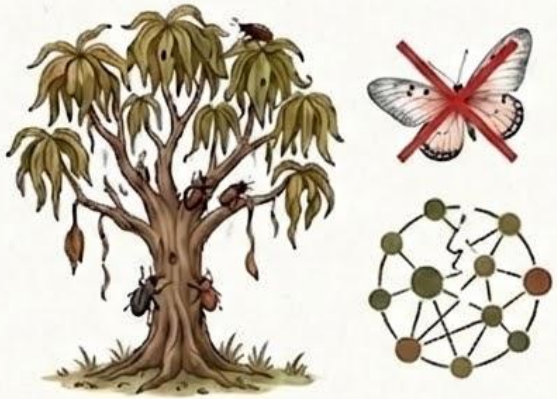
The “Newlands Example”: Pragmatic Urban Street Planting

In some areas like Newlands, the City has opted to replace Box Elders with Water Oaks (*Quercus nigra*).

While exotic, they grow fast and appear resistant to PSHB. This is a practical and common urban forestry decision to restore shade quickly.

Restoring the Wildlife Trees

Losing Habitats



Removing host trees like Kiggelaria breaks critical food web links, impacting species like the Garden Acraea butterfly.

Strategic Replacement Plan

Wild Olive: Resilient, drought-tolerant, non-reproductive host supporting fruit-eating birds.

White Stinkwood: Rapid-growing non-reproductive host, providing shade and bird food.

Tree Fuchsia: Crucial for sunbirds and pollinators; often resistant.

Restoring the Medicine Trees

The PSHB crisis severely impacts public health for the 72% of the population relying on traditional medicine. The beetle is destroying key medicinal species ("First Responders").

The Crisis

Critical species like Keurboom (*Virgilia oroboides*) and Cape Willow (*Salix mucronata*) are dying rapidly; both host the beetle. Stop replanting susceptible species like Salix in infested areas.

The Replacement Strategy & Resilient Species

Promote resilient medicinal alternatives in safe zones (community gardens, protected courtyards).

Warburgia salutaris (Pepper-bark Tree): Potent natural antibiotic, suitable for Cape Town, and not a known PSHB host.

Curtisia dentata (Assegai): Highly valued medicinal bark tree, currently recommended despite some pest susceptibility.

Restoring the Food Trees

Losing Food Security

PSHB threatens indigenous fruit trees like Wild Plum (*Harpephyllum caffrum*) and Kei Apple (*Dovyalis caffra*) – valuable sources of Vitamin C – that are PSHB reproductive hosts. Planting them in high-infestation.

Planting Safe Food Trees

White Milkwood: Protected tree with edible berries. Current surveys show no PSHB susceptibility, making it a 'Green List' candidate.

Num-num: Excellent for hedging and produces edible fruit. Not currently flagged as a host.

Forest Elder: Non-reproductive host, often resilient and supports pollinators, sustaining the ecosystem for food gardens.

PSHB Challenges Summary

Governance & Policy Friction

There is a lack of unified action, outdated management protocols, and institutional challenges caused by funding uncertainties and regulatory complexity.

Scientific & Diagnostic Gaps

Practitioners face difficulty identifying PSHB versus indigenous borers. Additionally, no single perfect treatment exists, leading to varied information regarding chemical efficacy.

Ecological Succession

There is an urgent need for a list of resilient indigenous replacement species and strategies to manage the transition from deep-shade to full-sun environments.

Public Safety & Technical Risks

Brittle dead trees (notably English Oaks) present physical hazards, raising liability concerns and requiring specialized, expensive removal equipment.

Logistical & Disposal Bottlenecks

Safe disposal of infected biomass is challenging due to the large volume of waste and a lack of budget for stump grinding or removal.

Human & Cultural Impact

The crisis involves significant emotional impact from losing heritage trees and conflicts between sanitation protocols and cultural/spiritual considerations.

Data & Monitoring Needs

Current efforts lack a shared directory for field observations and a robust citizen science network to track "survivor" species.

PSHB Opportunities Summary

1. Governance & Safety: The “Safe Streets” Initiative

- **Heritage Fast-Track:** Establish emergency status for dead Oaks in high-traffic areas to bypass 60-day waiting periods.
- **Liability & Access:** Clarify municipal vs. private responsibilities and create a shared pool for aerial equipment (MEWPs).

2. Practical Logistics: The “Biomass Economy”

- **Waste to Resource:** Develop "Safe Mulch" certification through solarization or composting (6–8 weeks) to allow the sale of infected wood chips.
- **Efficiency Pilots:** Use "Hole-Punch" stump boring for immediate indigenous replanting and launch sanitation badges for tree fellers.

3. Replanting Strategy: “The Future Forest”

- **Diversification:** Move away from monocultures toward a resilient, indigenous canopy using a verified "Safe Species" list (e.g., Harpephyllum, Sideroxylon).
- **Mandatory Succession:** Implement a "Seed for a Seed" pledge for every removal and provide transition kits for homeowners.

4. Monitoring & Community Engagement

- **"Green Eyes" Network:** Use citizen science (iNaturalist) and rapid field-testing kits to map the spread and identify "survivor" trees.
- **Cultural Rituals:** Create frameworks for community "closing rituals" led by traditional healers to honor significant heritage trees.
- **Education:** Launch myth-busting campaigns to stop "snake oil" treatments and unlicensed messaging.

Sources & Further Reading

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HAPPY BY NATURE

Indigenous Nursery & Botanical Studio

KIRSTENBOSCH
Kirstenbosch National Botanical Garden,
Gate 2, Rhodes Drive, Wynberg, 7800

KLOOF NEK
83 Kloof Nek Road, Gardens, 8001

TEL / WHATSAPP – 072 505 5742
EMAIL – hi@happybynature.com
WEB – happybynature.com

INSTAGRAM – happybynature_
FACEBOOK – happybynatureSA
LINKEDIN – happybynature-sa

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