



CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

POLYPHAGOUS SHOT HOLE BORER: PSHB

RECREATION & PARKS

April 2021

Making progress possible. **Together.**

PSHB!!!



Why are Trees Important?

- **Environmental:**

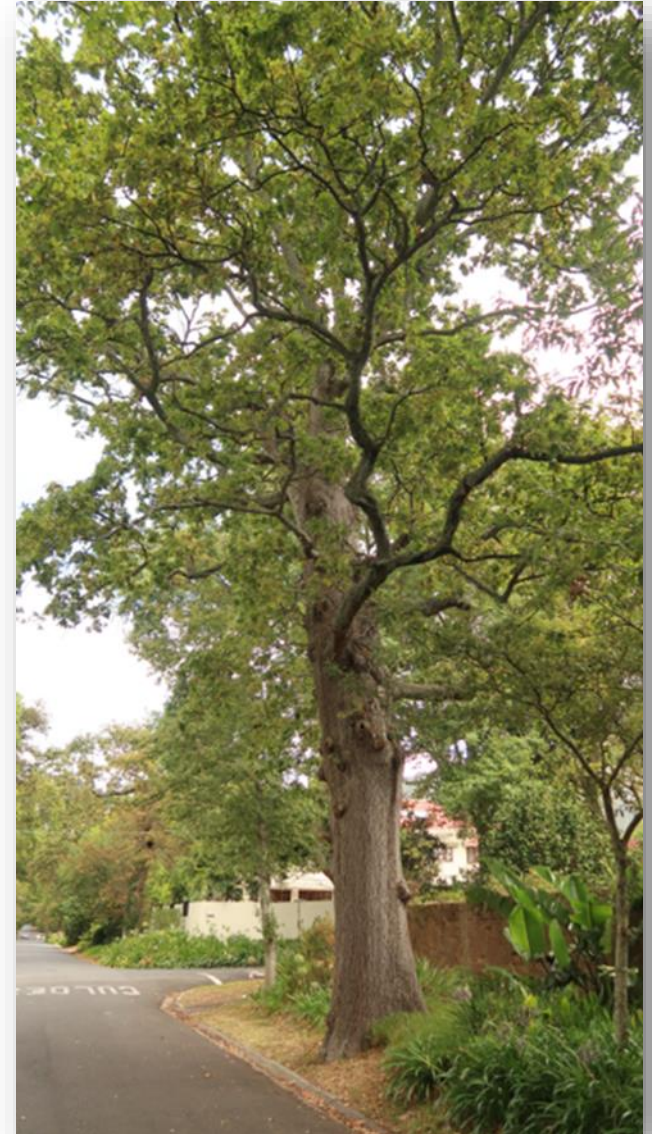
- Carbon fixing
- Climate control: cooler / warmer / shelter / shade
- Produce oxygen
- Protects soil erosion.

- **Social:**

- Nicer/ happier places
- “amenity value”

- **Economic:**

- property values up
- Reduce energy use
- Food production



We have much to loose

- Historical trees, Champion and Significant trees
- Tree Avenues (Oaks, Planes) Government Avenue; Fernwood, Newlands, Rondebosch
- Feeling of Place: Leafy suburbs
- Environmental benefits / services: Shade / Cooling
- Beauty
- Food security: (agriculture / fruit / **wine**)
- Biodiversity: indigenous species: Forests
- Already low overall tree canopy cover (7%; target 10%)

Whats the problem?

1. Invasive Beetle Arrives Polyphagous Shot-Hole Borer (PSHB)

PSHB is a tiny invasive black beetle from Asia that has recently arrived in South Africa. It is smaller than a sesame seed (2mm).



3. Fungus Sets In...

Fusarium Dieback

The female beetles carry a fungus (*Fusarium euwallaceae*) from tree to tree that grows in their tunnels. Adult beetles and their larvae depend on the fungus for food.



2. Beetles invade trees

The PSHB beetle makes tunnels, or galleries, in the trunks and branches of host trees and lay their eggs inside.



4. Trees are dying!

The fungus in the tunnels is really bad for trees as it disrupts the flow of water and nutrients to the tree causing branch dieback and ultimately the death of the tree.



5. Where do I report sightings?

Upload images and GPS coordinates of infested trees to the City of Cape Town Invasive Species Unit. Go to:

www.invasivescapetown.org.za

What Trees are at Risk?

The beetles attack exotic and indigenous trees. Oak trees and old drought stressed trees are at high risk. For a list of species affected in SA to date, go to: <http://www.fabinet.up.ac.za/pshb>

"A tree with dieback will have over 100 000 beetles in tunnels"

What to Look for?

Look for these signs of attack:

1. Entry-holes to the beetle tunnels. Round and less than 2mm wide.
2. Tree symptoms. Dark, wet staining; thick gumming; streaks of white powder or fine sawdust coming from holes. Symptoms are unique to each tree species.
3. Dieback. Dead branches with wilting leaves may be a sign of infection by the Fusarium Dieback disease.

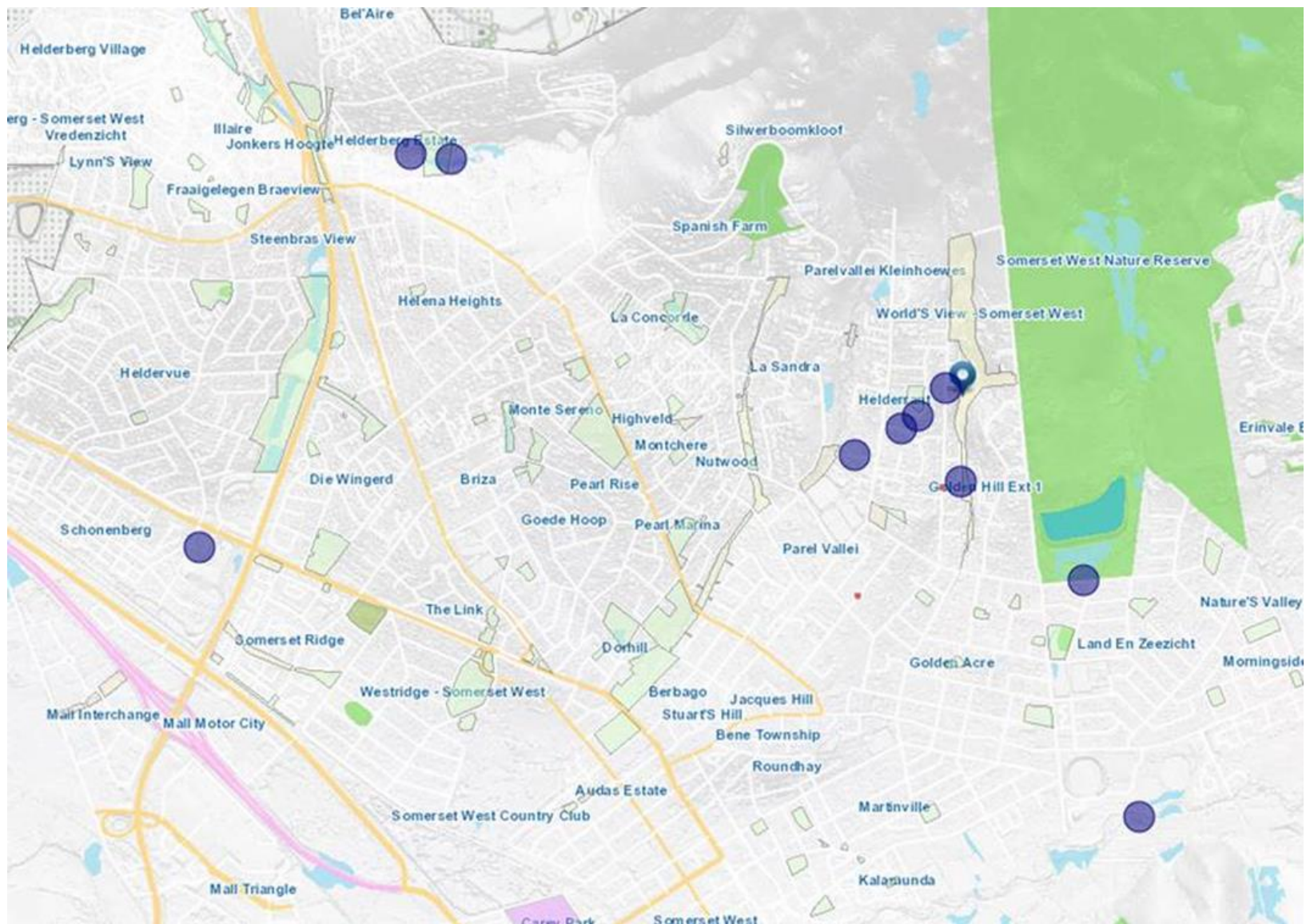
Host types

Type	Info	Treatment	Examples
Reproductive hosts	<p>Very favourable often severely infested often first infested (indicator species). The insect enters the tree; bores branching tunnels / galleries and multiplies in the tree. Insect exits the tree and infests other trees. Tree likely to die.</p>	<p>Current treatment (high priority); Remove and destroy (heavily infested) trees</p>	<p>Most Oaks Plane Liquidambar Box alder Black Wattle Coast Silver oak Poplars Keurboom More..</p>
Non reproductive hosts	<p>Less favourable. Insect often enters the tree and leaves through same tunnel. Insect may die in tunnel. Tree might be infected with Fusarium fungus. Tree may survive or die.</p>	<p>Lower priority. Monitor and / or treat.</p>	<p>Yellowwood Camphor Figs Jacaranda Elms Wild Olive Nuxia More...</p>

Current spread



April 2021



Expansion

- The infestation of PSHB has spread significantly in the past year.
- ISU was unable to confine the pest to its original confined area (Helderrant area of Somerset)
- The infestation has spread to most northern parts of Somerset West
- Also spread to the R44 (road to Stellenbosch; with significant risk of spread to Stellenbosch, Paarl etc.)

Reasons for rapid spread

- Hot windy summer
- COVID lockdown : staff was unable to monitor areas and control infested trees
- Lack of resources: Funding for contractors, staff
- Human influence: Garden refuse; firewood



What the City does?

- Environmental Management: Invasive Species Unit

- **First Response**
- One channel entry of reports
- Inspect, identify
- Action: remove, treat

- Recreation and Parks

- **“Custodian of Trees”**
- Advise on tree matters
- Educate and prepare own staff
- Operational involvement if required



First Oak tree infestation













Harewood St









Control 1

- Manageable: **may contain**, but cannot eradicate
- Spotting / inspection continues
- Cut down & remove (**heavily infested**) reproductive hosts
 - Sterilize tools
 - Transport under cover
 - Dedicated dumping sites (same day)
 - Burn, fumigate or solarize wood
 - Chipping to small size (<25mm)
 - Remove / cover stumps
- Future: Plant resistant tree species

Control 2

- **Chemical control of valuable trees**
 - Stem injections of pesticides / Fungicides
 - Not 100% efficient
 - Prolonged Treatment may kill the tree
- **Chemical lures and traps (expensive, small areas)**

Action steps

- Public information and education: Media release
 - Remind public not to transport infested material
 - Public response may be expected: emotive, sentimental (with good reason)
- Possibly escalate (again) to City Management & Provincial level.
- Inform other Stakeholders: Env Management; Disaster Control (possibly)
- Possible financial support to ISU
- Funding for research: Univ Stellenbosch
- (Possibly) assist with large scale tree removal; chipping, incineration (as per protocol to prevent spread)

The future

- It is very likely that PSHB will spread to other parts of the city; ***the urban forest will change.***
- Loss of canopy cover is to be expected.
- Many historical trees may be affected: oaks, planes, poplars
- Some invasives species also infested: Populus canescens
massive implications (bad: tree loss, erosion. good: control invader plants; water turnoff)
- Tree planting should be aimed at correcting this loss by planting non target (resilient) species.
- However: this PSHB insect is opportunistic and adaptable; if host species is not available; they may move to a next: Lists are not absolute and changing

Act soon

- The insect spreads about 1km per month
- Transported by vehicles, people, wind
- Control and confine early: spreads like a fire: starts small, then quicker

Polyphagous Shot Hole Borer (*Euwallacea* sp.) and Fusarium dieback (*Fusarium euwallaceae*)

The Polyphagous Shot Hole Borer (PSHB) is an ambrosia beetle native to Southeast Asia. In 2017 this pest was detected on London Plane trees in the Fynbos/Hotel National Botanical Garden, Pietermaritzburg. It has been confirmed in Durban, Hartswater, Bloemfontein, George, Knysna and Johannesburg. The beetle has a symbiotic relationship with the fungus *Fusarium eurotiae* which serves as a food source for the adults and their larvae. In susceptible trees the fungus causes Fusarium dieback which can lead to branch dieback and tree death. The beetles can attack a wide range of exotic and indigenous trees in urban, agricultural and natural landscapes.



Photo: S. Sakh

The adult female is 1.8–2.0 mm long. Males are smaller and flightless.

PSHB is not able to complete its life cycle on all of the tree species it attacks; those that the beetle is able to breed on are referred to as 'reproductive hosts'. Important reproductive hosts include species of oak, maple, willow and cork trees, avocado and cedar tree. The full list of confirmed hosts in South Africa can be viewed at www.fabnet.up.ac.za/psahb/hosts

The movement of infected wood is an important pathway for spread of the beetle and appropriate disposal of infected trees (by chipping/composting, solarisation or burning) will be key to reducing the spread of this damaging pest.

Surveys to monitor the spread of the beetle and fungus in South Africa are continuing. The public can assist by looking out for symptoms. Suspected instances can be reported on iNaturalist.



Chinese maple killed by PSHB and its fungus



Reproductive galleries in pecan



PSHB galleries in cork tree




Shot-hole-like symptoms on London Plane

FABI Compiled by ZW de Beer & T. Paap www.fabnet.up.ac.za

SANBI South African National Biodiversity Institute

FABI Life stages of the Polyphagous Shot-hole Beetle (PSHB) (*Euwallacea* sp. nr. *forficatus*)



1. Entrance hole in the bark.
2. Branching breeding and feeding galleries, lined with a layer of spores of the fungal associate of the beetle that serve as food to the beetle and its larvae.
3. Larvae of the beetle.
4. Usually only one male per gallery. The adult male is lighter in colour and smaller than the female beetles.
5. Young females are light brown, and become darker with age.
6. The adult female is about 2 mm long.

Photo: ZW de Beer

Compiled by ZW de Beer, FABI. <https://www.fabnet.up.ac.za/>

FABI Polyphagous Shot-hole Borer (*Euwallacea* sp. nr. *forficatus*): symptoms vary on different tree species in South Africa



1. Dying wild plum tree: wilting, drying and shedding leaves before complete branch dieback.
2. English oak with branches dying back.
3. Dieback of branches on paper bark thorn tree.
4. Chinese maple killed by PSHB infestation.

Compiled by ZW de Beer, FABI. All photos unless otherwise stated by ZW de Beer. <https://www.fabnet.up.ac.za/>

www.fabnet.up.ac.za/psahb

FABI Ambrosia beetle infestations: which photos to take



1. Picture of tree showing dying parts.
2. Picture to identify tree including tree number, leaves, flowers/seeds, stem/bark.
3. Zoom in on affected area.
4. Zoom in on holes, scrape bark off one hole to show tunnel.

Compiled by ZW de Beer, FABI. <https://www.fabnet.up.ac.za/>

FABI Polyphagous Shot-hole Borer (PSHB) External Symptom Types



H-Hole F-Frass DN-Dry Noodle WN-Wet Noodle J-Jelly drop R-Resin (sticky or dry)
WS-Wet spot L-Light stain SF-Sugar Fountain S-Sapflow RL-Raised Lesion C-Callus

Compiled by ZW de Beer, FABI. <https://www.fabnet.up.ac.za/>

FABI Taking samples of Ambrosia beetle infested bark & wood



1. Cut & peel pieces of bark around entrance holes of the beetles.
2. Cut or chisel out pieces of stained wood under the bark around tunnels of the beetles.
3. Cut or chisel out pieces of infested wood.
4. Saw short billets (20-30 cm) of thin trees or branches.

Compiled by ZW de Beer, FABI. <https://www.fabnet.up.ac.za/>

Thank you



