



Food and Agriculture  
Organization of the  
United Nations



International  
Plant Protection  
Convention



Department  
for Environment  
Food & Rural Affairs

# Tools and strategies for countries to implement early warning systems

**International Plant Sentinel Network**

---

London, 21 – 23 September 2022

## International Plant Health Conference



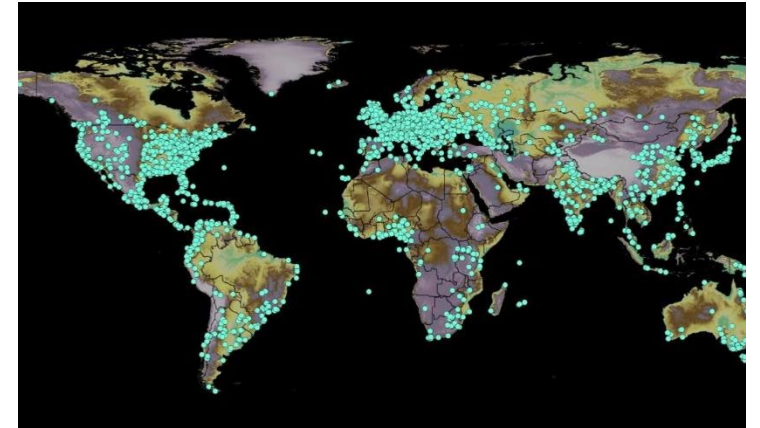
## International Plant Sentinel Network (IPSN) - Background

- Invasive alien plant pests and pathogens pose a considerable threat to plant health worldwide
- Increasing globalisation of trade in plants and plant material + the effects of climate change means this threat will continue to rise
- Identifying the pests and pathogens likely to pose future threat is challenging but crucial



# International Plant Sentinel Network (IPSN) Background

- Over 3,000 botanic gardens and arboreta around the world
- Cultivate over 100,000 species
- More than one third of the world's known plants
- Many grown in collections outside their native range
- Managed by skilled and committed staff
- Linked through Botanic Gardens Conservation International (BGCI)



## IPSN Background

- Plants growing outside their native range can be monitored for damage by pests and pathogens
- This provides information on the risk one of these organisms could pose if introduced into the plant's native range – thus providing early warning of threats
- Botanic gardens and arboreta are unique and under-utilised resources that can support sentinel research



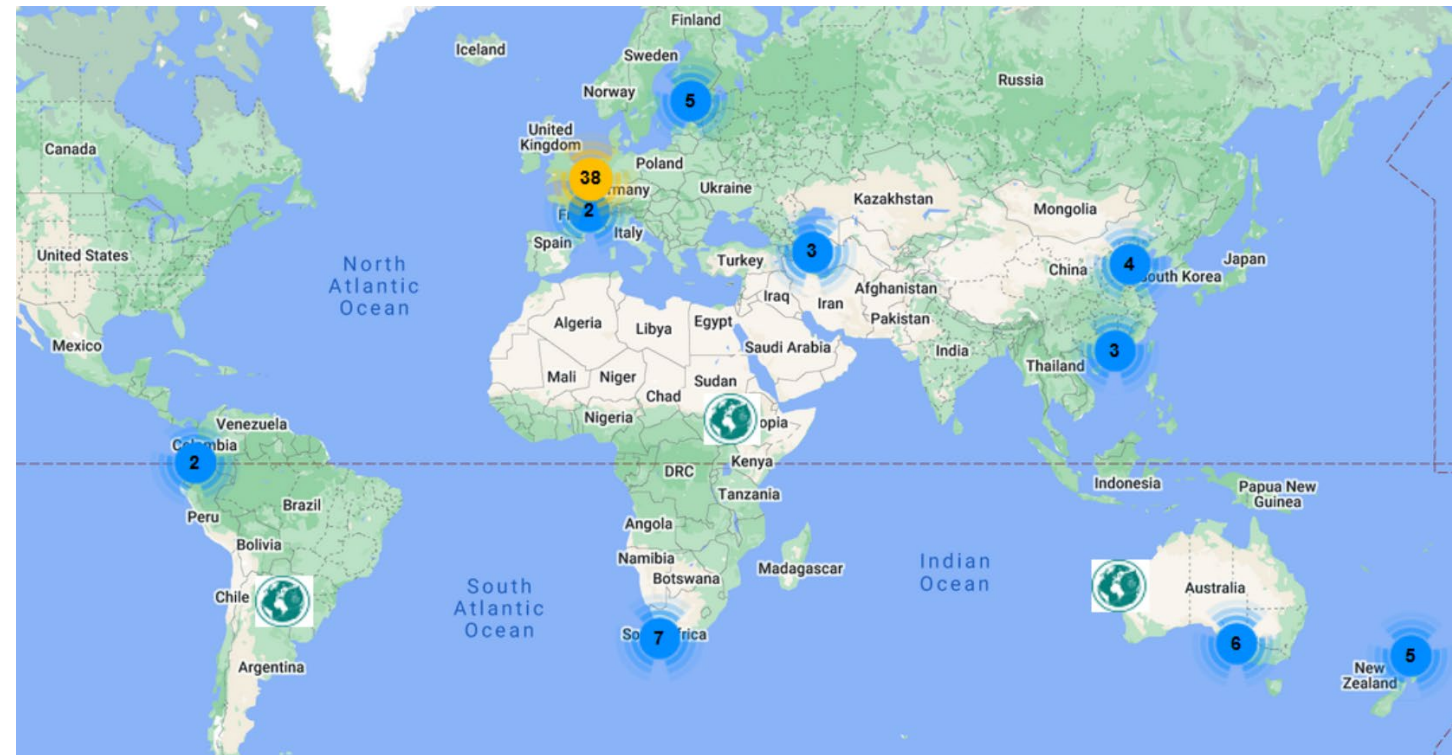
**IPSN**

International Plant  
Sentinel Network



## IPSN – the network

- A global network of botanic gardens, arboreta, plant health institutes and National Plant Protection Organisations (NPPOs) working together to provide an early warning system for new and emerging pest and pathogen threats



## IPSN Activities

- Targeted surveys – gardens survey for specific pests on specific hosts (e.g. Emerald Ash Borer on Ash trees)
- General surveillance – priority species are monitored for any pests and diseases that may be present
- Capacity building – workshops / training courses on pest and disease identification, monitoring and surveying
- Information provision – posters and other materials proving information on new and emerging pests
- Information on general biosecurity issues and on specific pest and disease risks



# Emerald Ash Borer

- Gardens in Eastern Europe with *Fraxinus* in collections identified
- Training in identifying EAB by UK/US experts
- Survey forms and other resources (posters / videos) provided
- Traps and lures provided to selected gardens
- Contacts with local entomologists facilitated
- On-going surveying across Eastern Europe
- Focus on susceptible *Fraxinus* species



# FAGUSTAT: Investigating Beech Leaf Disease in Europe

- A new disease affecting several species of *Fagus* (*F. grandifolia*, *F. sylvatica*)
- Present in US and Canada
- Linked with a nematode but disease association not clear
- Require leaf samples and surveillance





## BEECH-LEAF-DISEASE

**The threat:** Beech leaf disease (BLD) is a new disease of beech trees (*Fagus* spp.) first reported on American beech in Ohio and rapidly spreading to forest and landscaped areas in neighbouring regions. A nematode (*Litylenchus creatae-mccannii*) has been isolated from the symptomatic leaves and buds. The disease is spread both long-distances and locally by infested plants, windborne infested plant material (leaves/shoots) and leaf/litter/soil infested with nematodes. BLD has recently been described as a syndrome, but further research is needed to assess the potential roles of this nematode and to evaluate if the disease is associated with a complex of pathogens. BLD is mainly known to affect the American beech (*Fagus grandifolia*), though it is also been observed on European beech (*F. sylvatica*) and Oriental beech (*F. orientalis*). Chinese beech (*F. engleriana*) is also considered as a potential host.

The IPSN is therefore conducting a survey to monitor the spread of BLD in botanic gardens in European countries. We would be most grateful if you could survey the *Fagus* spp. in your collection using this survey form. As *Petrakia* symptoms are similar to the damage caused by BLD the survey also includes a section on *Petrakia* leafspot (*Petrakia liobae*). Please use one form per tree and refer to the accompanying poster for further details and identification help.

Survey Details			
Name of Botanic Garden / Arboretum			
Country			
Address			
Survey carried out by			
Date of survey			
Best description of season			
Tree Details			
Species (cultivar)			
Accession number			
GPS			
Country/region species is native to			
Age (years)			
General Description of Health			
Generally healthy	<input type="checkbox"/>	Some damage	<input type="checkbox"/>
Dying	<input type="checkbox"/>	Dead	<input type="checkbox"/>
Any recent changes in health or overall look			

Section Break (Next Page)



## EMERGING PEST AND DISEASE THREATS IN THE UK

### BEECH (*Fagus* spp.)

Beech (*Fagus* spp.) are long-lived trees and can reach a height of up to 40m when mature. Beech trees will produce both male catkins and small female flowers in the spring. These are followed by the fruit known as a beechnut/mast, found in small burrs that drop from the tree in autumn. The following emerging diseases are known to affect beech trees.

#### Beech Leaf Disease (BLD)

'Beech Leaf Disease' (BLD) is a new disease of beech trees (*Fagus* spp.) first reported on American beech in Ohio and rapidly spreading to forest and landscaped areas in neighbouring regions. A nematode (*Litylenchus creatae-mccannii*) has been isolated from the symptomatic leaves and buds. The disease is spread both long-distances and locally by infested plants, windborne infested plant material (leaves/shoots) and leaf/litter/soil infested with nematodes. BLD has recently been described as a syndrome, but further research is needed to assess the potential roles of this nematode and to evaluate if the disease is associated with a complex of pathogens. BLD is mainly known to affect the American beech (*Fagus grandifolia*), though it is also been observed on European beech (*F. sylvatica*) and Oriental beech (*F. orientalis*). Chinese beech (*F. engleriana*) is also considered as a potential host.

#### Symptoms

Symptoms of beech leaf disease include: dark bands forming between the veins of leaves (Fig. a); leaves becoming curled, deformed, and shrivelled (Fig. b); premature leaf drop; aborted buds; and thinning canopy. Early symptoms include dark green striped bands between lateral leaf veins and reduced leaf size. Banded areas usually become 'leathery' and leaf curling may be observed. It can be quite helpful to stand underneath the canopy and look upwards as this may help you see the dark bands between the veins of the leaves. As symptoms progress, buds fail to develop, leaf production is reduced and premature leaf drop lead to an overall reduction in canopy cover, ultimately, resulting in death of young trees within 5 years and mature trees within 10 years. In areas where the disease has established, the proportion of symptomatic trees can reach more than 50%. However, some variability in susceptibility and symptom development has been reported. The numbers of nematodes present in symptomatic foliage will fluctuate throughout the year and they can overwinter in buds and fallen leaves.



a) dark green striped bands between lateral veins of leaves

b) Chlorosis and necrosis of leaves, leathery appearance and reduction in leaf size.

The key diagnostic feature of bands between veins of leaves will not be seen until early summer and then into early autumn. Symptoms become harder to distinguish during autumn due to natural senescence.

#### Petrakia leafspot *Petrakia liobae*

*Petrakia liobae* (*Petrakia* leafspot) is an emerging fungal pathogen threatening beech. It is thought to be a European species and not introduced. The fungal pathogen was first discovered in Switzerland in 2008, followed by findings in Germany, Austria, Slovakia and most recently Slovenia in 2016. Infected trees develop brown, irregular leaf spots with sharp, dark borders. These necrotic spots are around 1–50mm in diameter and may merge in cases of heavy infection (Fig. c). Mature lesions may also have tiny white spots of fluffy white propagules (detachable spores) associated with the leaf spot. Look for symptoms in the lower canopy as the *P. liobae* overwinters in the leaf litter and re-infects beech trees in the spring.



c) Beech leaves with necrotic spots, blotches and white fluffy propagules caused by Petrakia liobae.

REPORT ANY SUSPECTED SIGHTINGS TO \_\_\_\_\_ DATE: \_\_\_\_\_

For more information about the IPSN go to: [www.plantsentinel.org](http://www.plantsentinel.org)

**Please note:** If you see symptoms in your specimens similar to those highlighted above please follow the guidance provided by the Observations Field guide (<https://www.observations.org.uk/observations-field-guide>) and report to: TreeAlert (<https://www.treealert.org.uk/submit>) or Tree Check (<https://www.treecheck.net/submit>)



## General Surveillance

- Identification of priority species in collections outside native range
- Collection of historical data – any records of past P&D on these hosts
- Investigation of any present problems using Plant Health Checker form and with diagnostic support
- Linking collections with NPPOs before sharing any new findings



# Tools and resources



International Plant  
Sentinel Network

A reference guide to accompany the  
deciduous and conifer  
IPSN Plant Health Checker



## 4. Needles - bands

This may not be obvious at first, but looking closely at discoloured needles may reveal banding (as opposite)



Light green /  
yellow banding



Brown / red  
bands

thistroma needle blight damage

## 7. General Pest Observations



Bore holes - small  
holes found on the  
trunk and  
branches, which  
are the exit holes  
of wood boring  
insects



Frass - fine  
powdery material  
or perforated  
wood found in  
clump, often  
produced by wood  
boring insects or  
the excrement of  
insect larvae



Insect mines -  
tunnels forming  
patterns made  
by leaf mining  
insects



## Some results

- Information on impact of US oak-boring beetles on English oaks
- First reports of a number of P&D in countries through surveys in botanic gardens and arboreta
- Development of electronic data gathering tools
- Enhanced networks and linkages between plant collection holders and NPPOs
- Capacity in P&D monitoring built amongst botanic garden staff





Food and Agriculture  
Organization of the  
United Nations



International  
Plant Protection  
Convention



Department  
for Environment  
Food & Rural Affairs

# Acknowledgements



Department  
for Environment  
Food & Rural Affairs



**Forest Service**  
U.S. DEPARTMENT OF AGRICULTURE

London, 21 – 23  
September 2022

## International Plant Health Conference

**Suzanne Sharrock**

*Director of Global Programmes, Botanic Gardens Conservation International*

