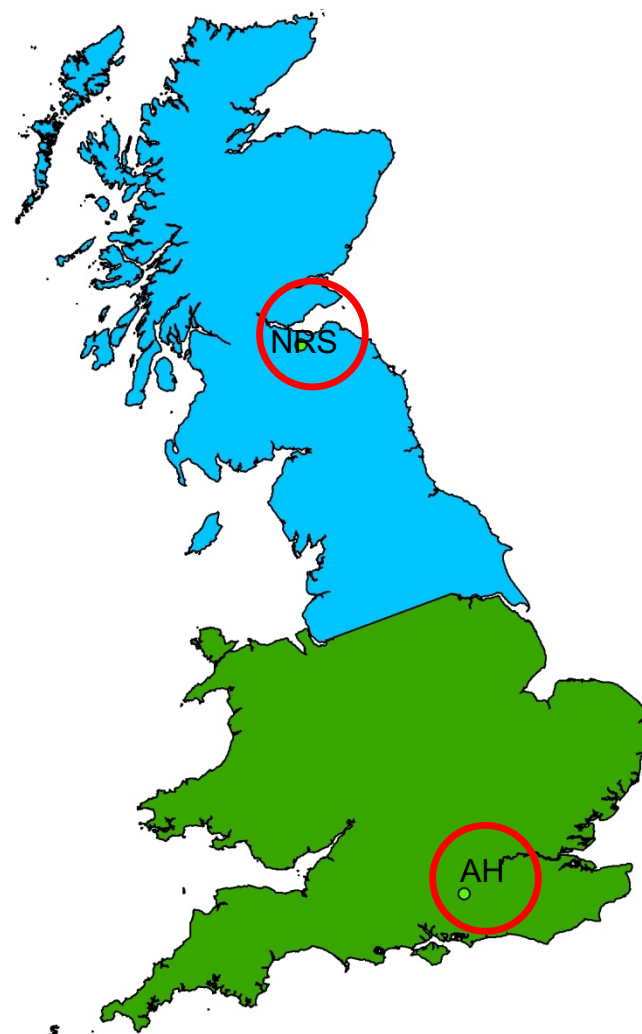


Overview of tree diseases through the Tree Health Diagnostic & Advisory Service (THDAS) at Forest Research since 2013

Ana Pérez-Sierra

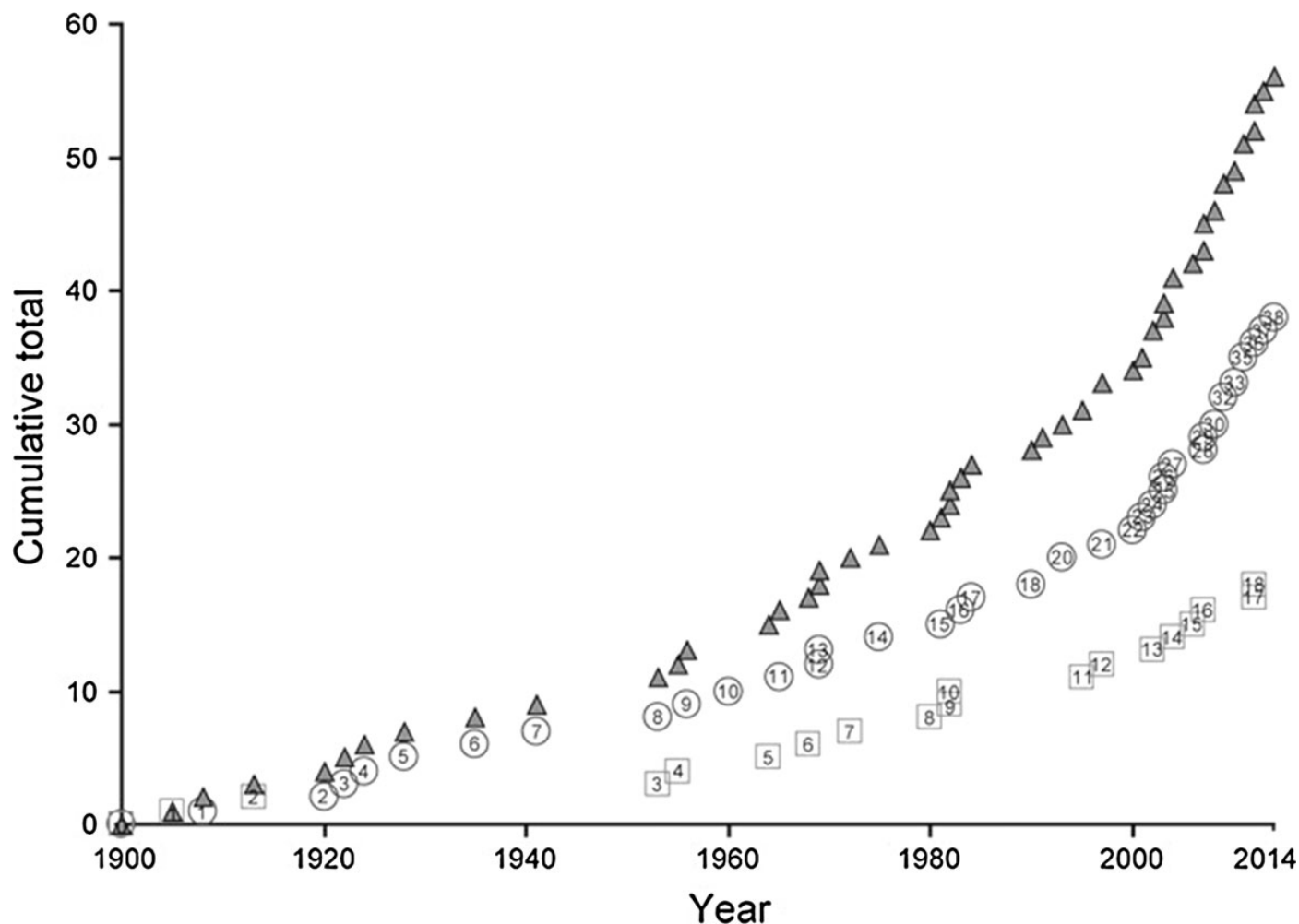
Forest Research, Alice Holt Lodge,
Farnham

- Tree Health Diagnostic and Advisory service (THDAS)
- It has been running since the 1960s
- Provides impartial advice or identify pest and pathogens on trees in Britain
 - Public and Private sector forestry
 - Local authorities
 - Arboricultural consultants and tree surgeons
 - General public
- Two stations cover the UK
 - Northern Research Station (Edinburgh)
 - Scotland and Northern England
 - Alice Holt (Farnham, Surrey)
 - Southern England and Wales
- Work alongside tree health teams from all three countries (FC England, Scottish Forestry, Natural Resource Wales)

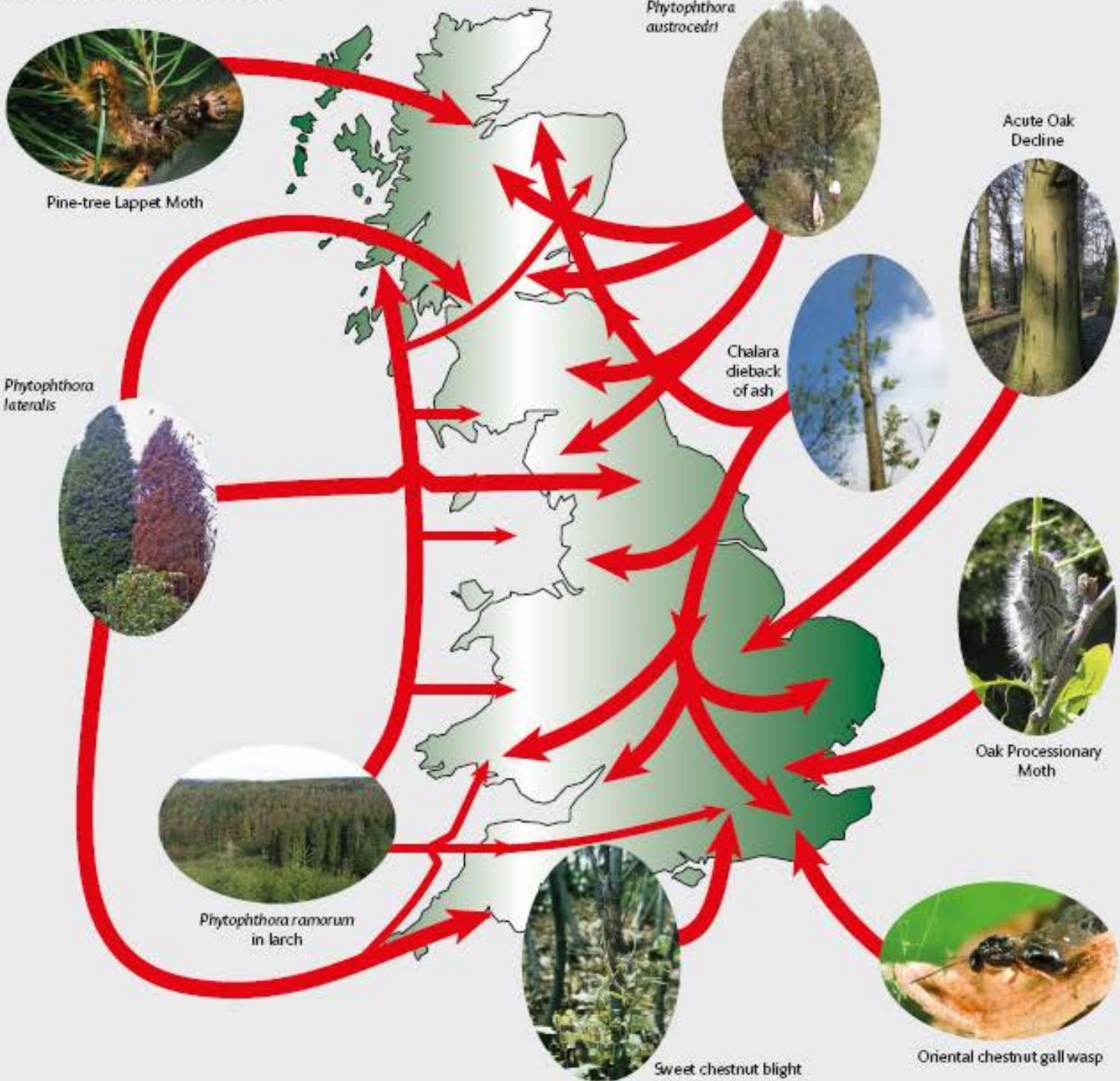


How do we fit in the bigger picture of Tree Health?

- New threats to plant health are constantly emerging



The cumulative numbers of new tree pathogens (circle) and insect pests (square) identified in the UK shown over time since 1900. The total accumulated number of pathogens and pests are also shown (grey triangle). (Freer-Smith & Webber, 2015)

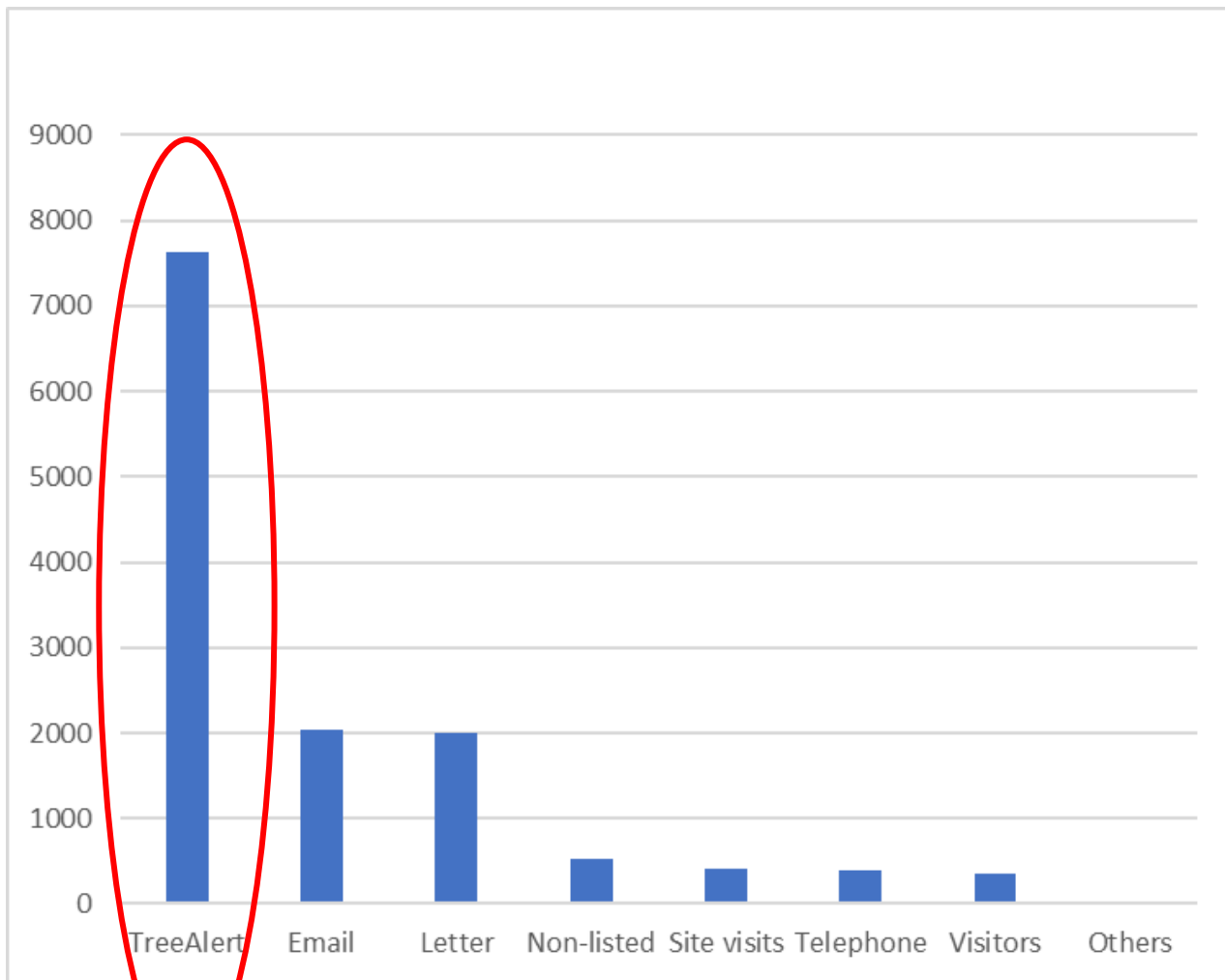


- Gather information about the health of trees in Britain
- Identify trends about pests and pathogens occurrence and spread
- Have an indication of the most common disorders
- Identify new threats to British trees (horizon scanning)
- Contribute to the management of pests and diseases in Britain
- Works closely with other agencies, other laboratories and with DEFRA
- Provide advice to owners, managers or relevant authorities
- THDAS acts as an early warning system for tree health

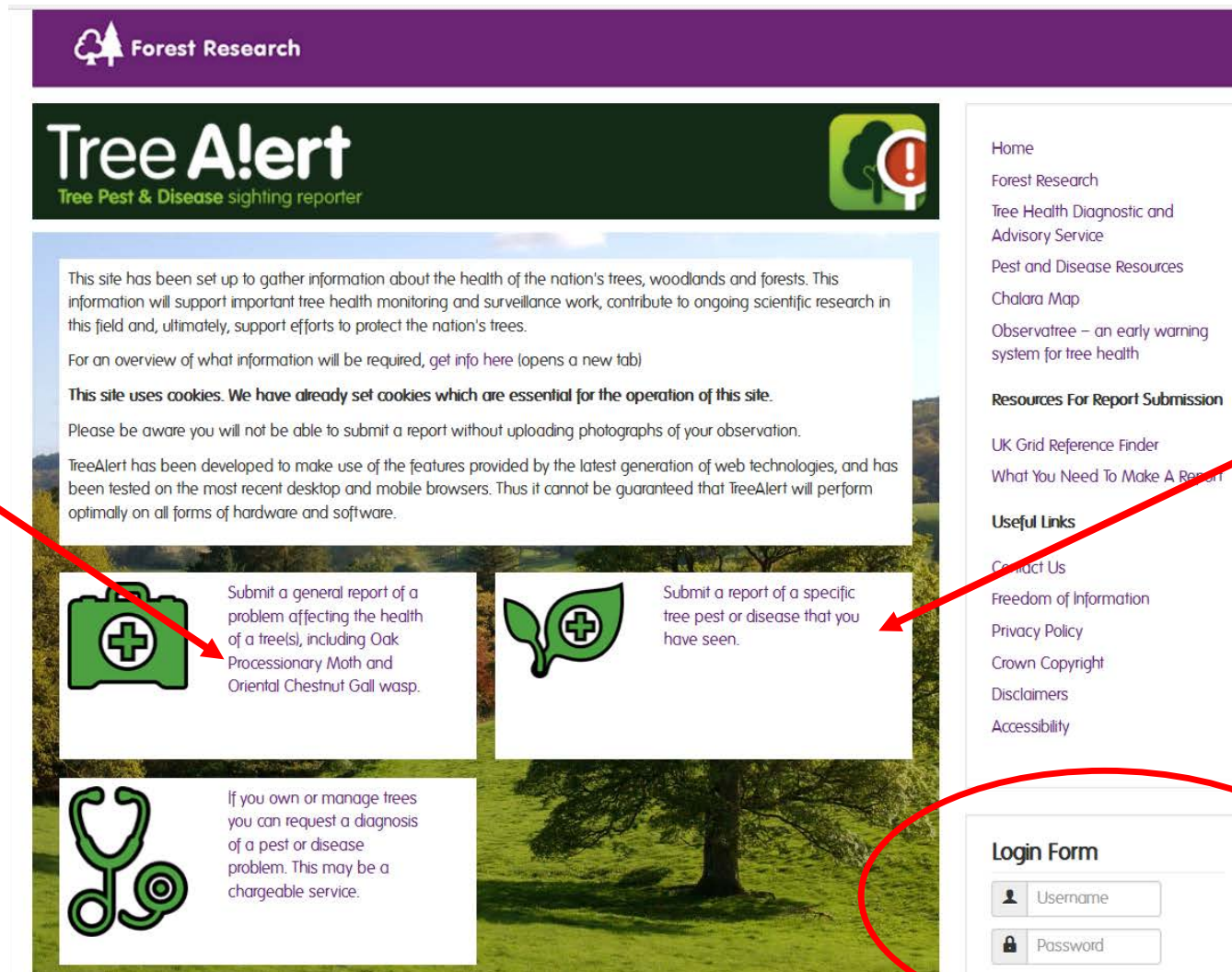
- New and emergent pests and diseases
 - Pathogenicity test
- Common pests and diseases
 - Occurrence
 - Trends
 - Changes due to environmental conditions
- 'Unknowns'
 - These could be the new problems of tomorrow
- Annually survey tree collections
- Projects: Raising awareness



- Enquiries reach us using different routes



- TreeAlert is a system for reporting suspected tree pests and diseases of concern in Britain (<https://treealert.forestresearch.gov.uk/>)



The screenshot shows the TreeAlert website interface. At the top, there is a purple header with the Forest Research logo and the text 'Forest Research'. Below this is a dark green banner with the 'TreeAlert' logo and the tagline 'Tree Pest & Disease sighting reporter'. The main content area features a light blue background with a tree image. It contains several text blocks: a welcome message, a link for more information, a cookie notice, and a disclaimer. Below these are three white boxes with green icons: a first aid kit for general reports, a leaf with a cross for specific pest/disease reports, and a stethoscope for diagnosis services. On the right side, there is a white sidebar with a navigation menu including 'Home', 'Forest Research', 'Tree Health Diagnostic and Advisory Service', 'Pest and Disease Resources', 'Chalara Map', 'Observatree', and 'Resources For Report Submission'. The 'Resources For Report Submission' section includes 'UK Grid Reference Finder' and 'What You Need To Make A Report'. Below this is a 'Useful Links' section with 'Contact Us', 'Freedom of Information', 'Privacy Policy', 'Crown Copyright', 'Disclaimers', and 'Accessibility'. At the bottom right, a 'Login Form' is circled in red, containing 'Username' and 'Password' input fields.

Tree A!ert

Tree Pest & Disease sighting reporter



Specific Tree Pest or Disease

This page allows you to report on certain pests or diseases. These are:



Chalara dieback of Ash



Dothistroma needle blight (aka Red band needle blight)



Acute Oak Decline



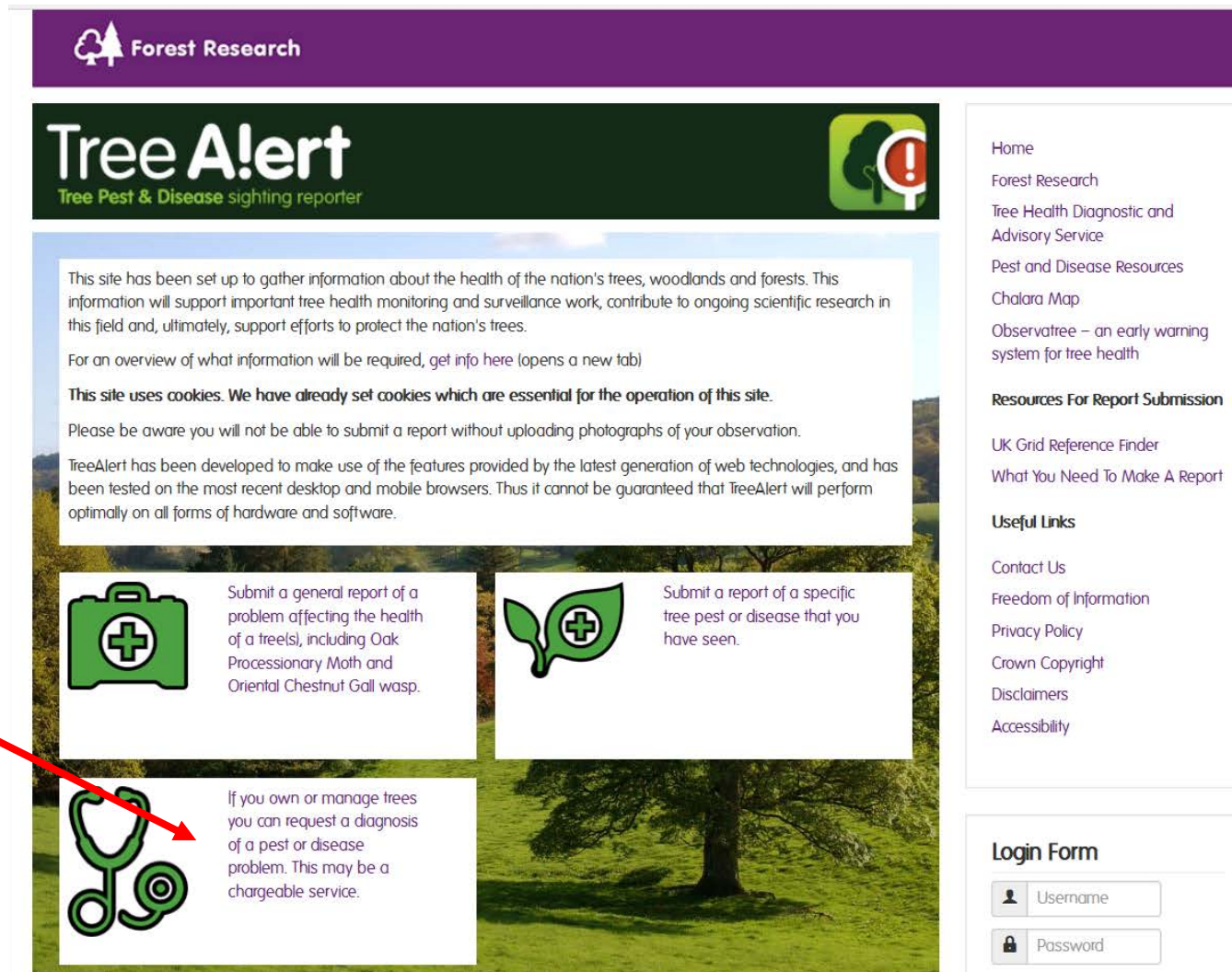
Phytophthora lateralis



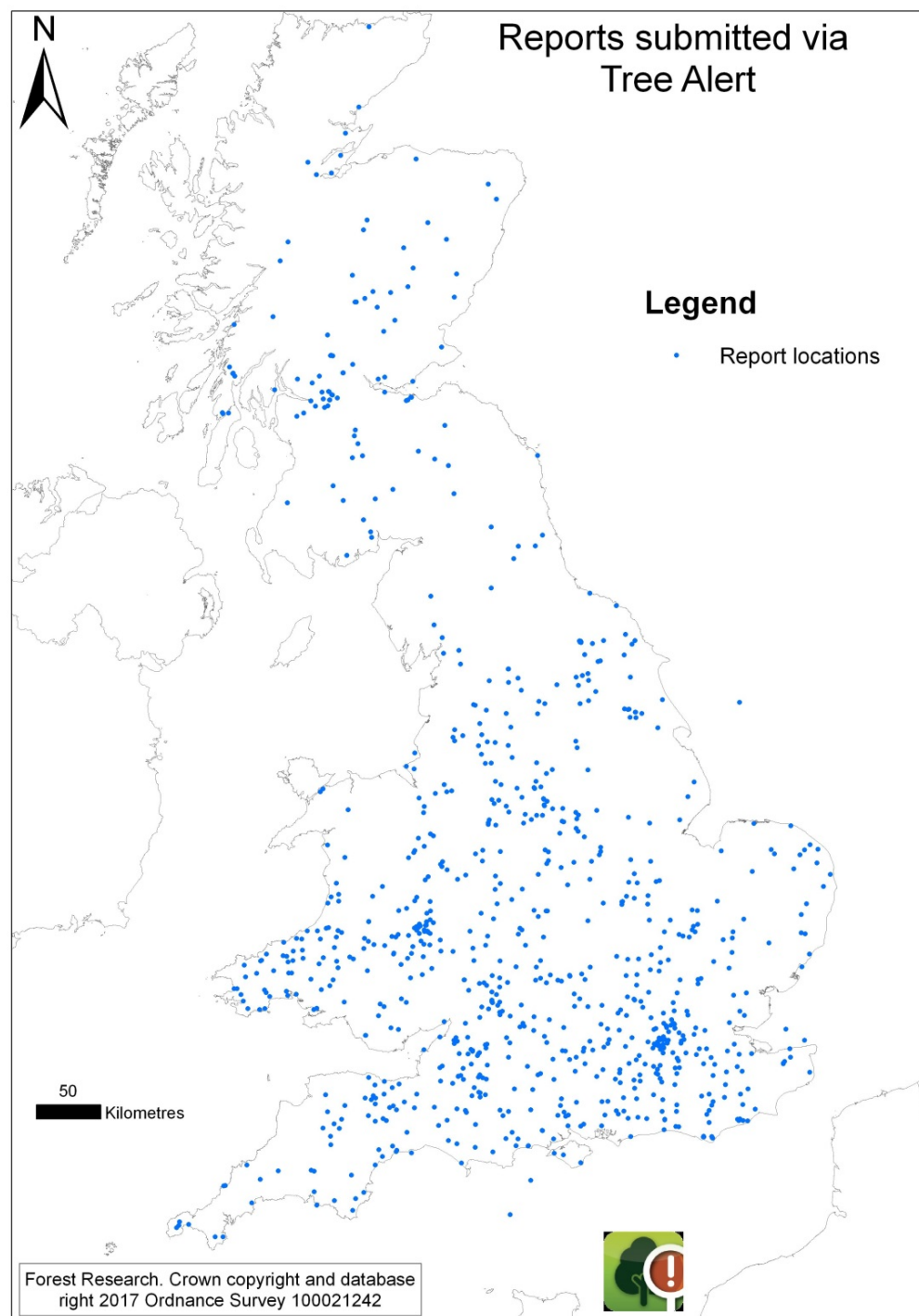
Asian Longhorn Beetle or Citrus Longhorn Beetle

If you are unsure of what you have seen, or think you have seen a pest or disease that does not appear on the list above, then please submit a general report.

- TreeAlert is a system for reporting suspected tree pests and diseases of concern in Britain (<https://treealert.forestresearch.gov.uk/>)

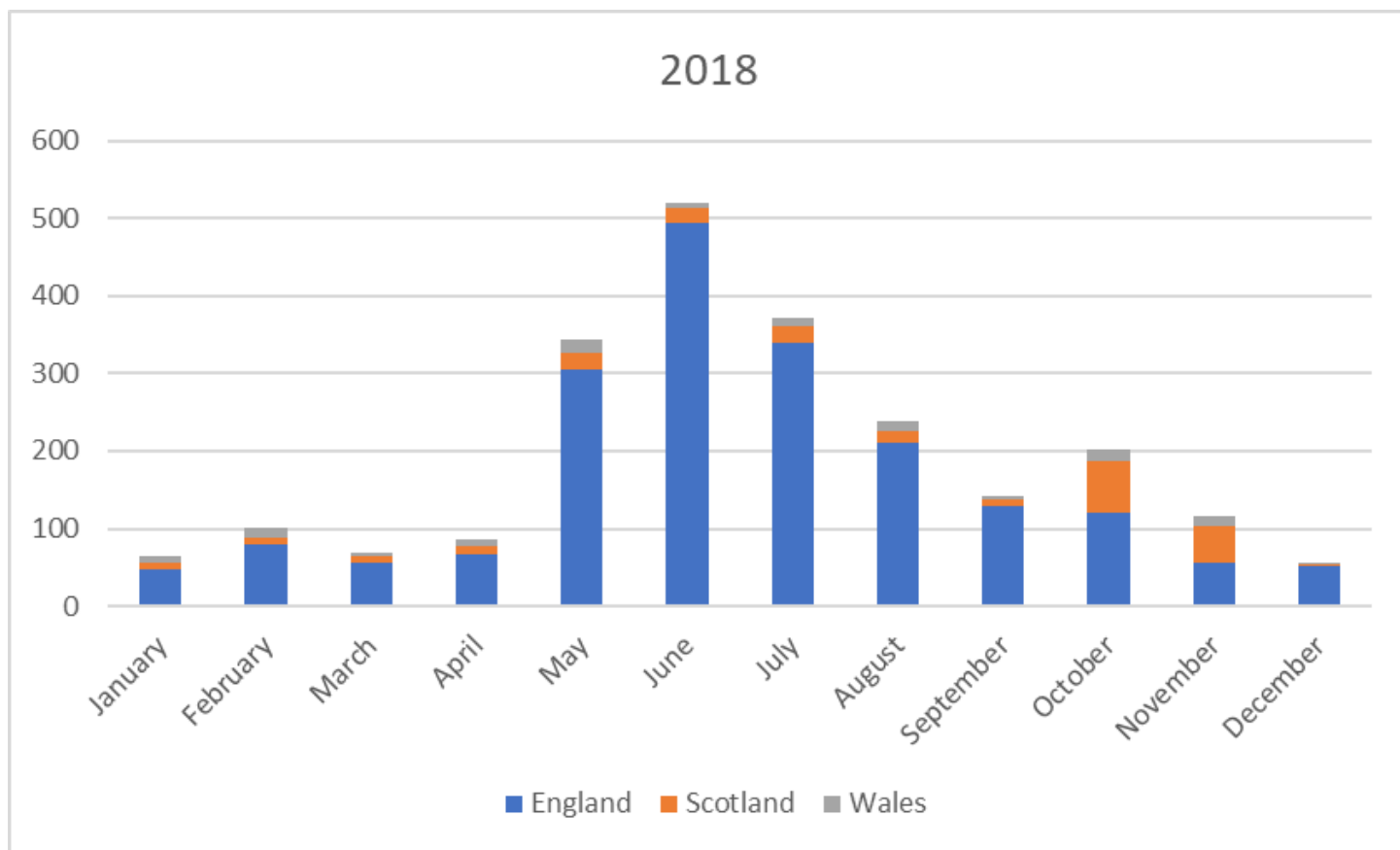


The screenshot shows the TreeAlert website interface. At the top is a purple header with the Forest Research logo and name. Below this is a dark green banner with the 'TreeAlert' logo and the tagline 'Tree Pest & Disease sighting reporter'. The main content area features a light blue background with a white text box containing introductory text and a link to 'get info here'. Below this, there are three white boxes with green icons: a first aid kit for general reports, a leaf with a cross for specific pest/disease reports, and a stethoscope for diagnosis services. A red arrow points from the bottom left towards the stethoscope icon. On the right side, there is a white sidebar with a navigation menu including 'Home', 'Forest Research', 'Tree Health Diagnostic and Advisory Service', 'Pest and Disease Resources', 'Chalara Map', 'Observatree', 'Resources For Report Submission', 'UK Grid Reference Finder', 'What You Need To Make A Report', 'Useful Links', and 'Login Form'. The 'Login Form' section includes fields for 'Username' and 'Password'.



- TreeAlert reports are checked daily
 - Triage
 - Enquiries are allocated to entomologists or pathologists
 - Priority given to regulated or quarantine organism
 - These cases are followed up by the wider Plant Health Services, the authorities in England, Scotland and Wales
 - In some cases are followed directly by THDAS team members
 - Reply to all enquiries
 - In some cases THDAS might request samples
 - In some cases site visits need to be arranged

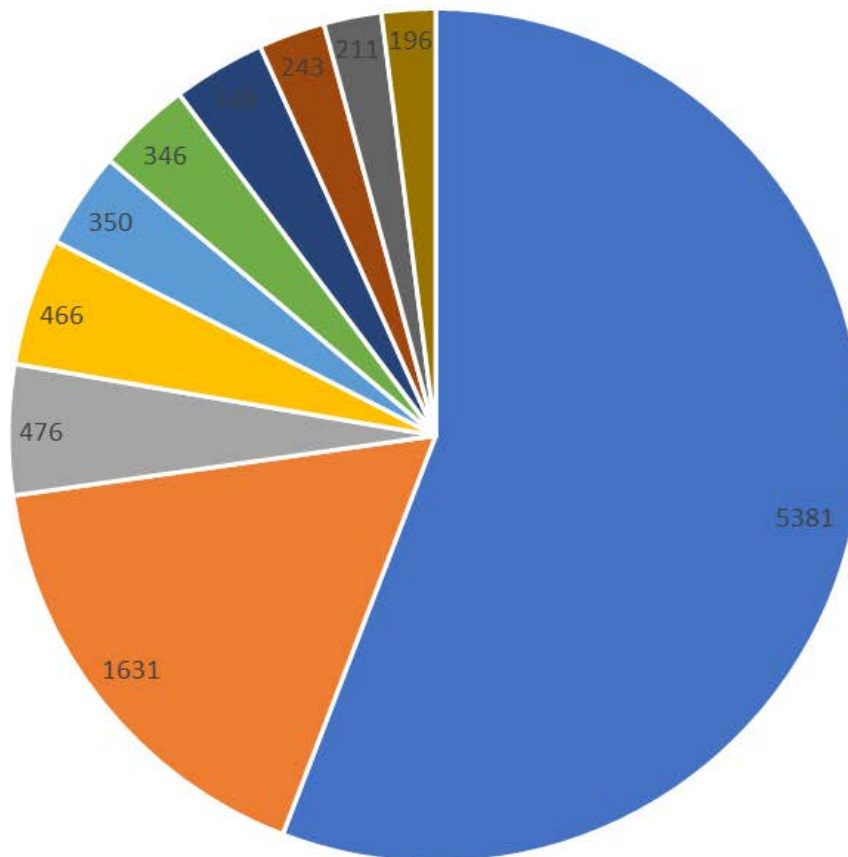
- Each year is different depending on weather conditions, new detections or press releases related to tree health problems
- Always a pattern



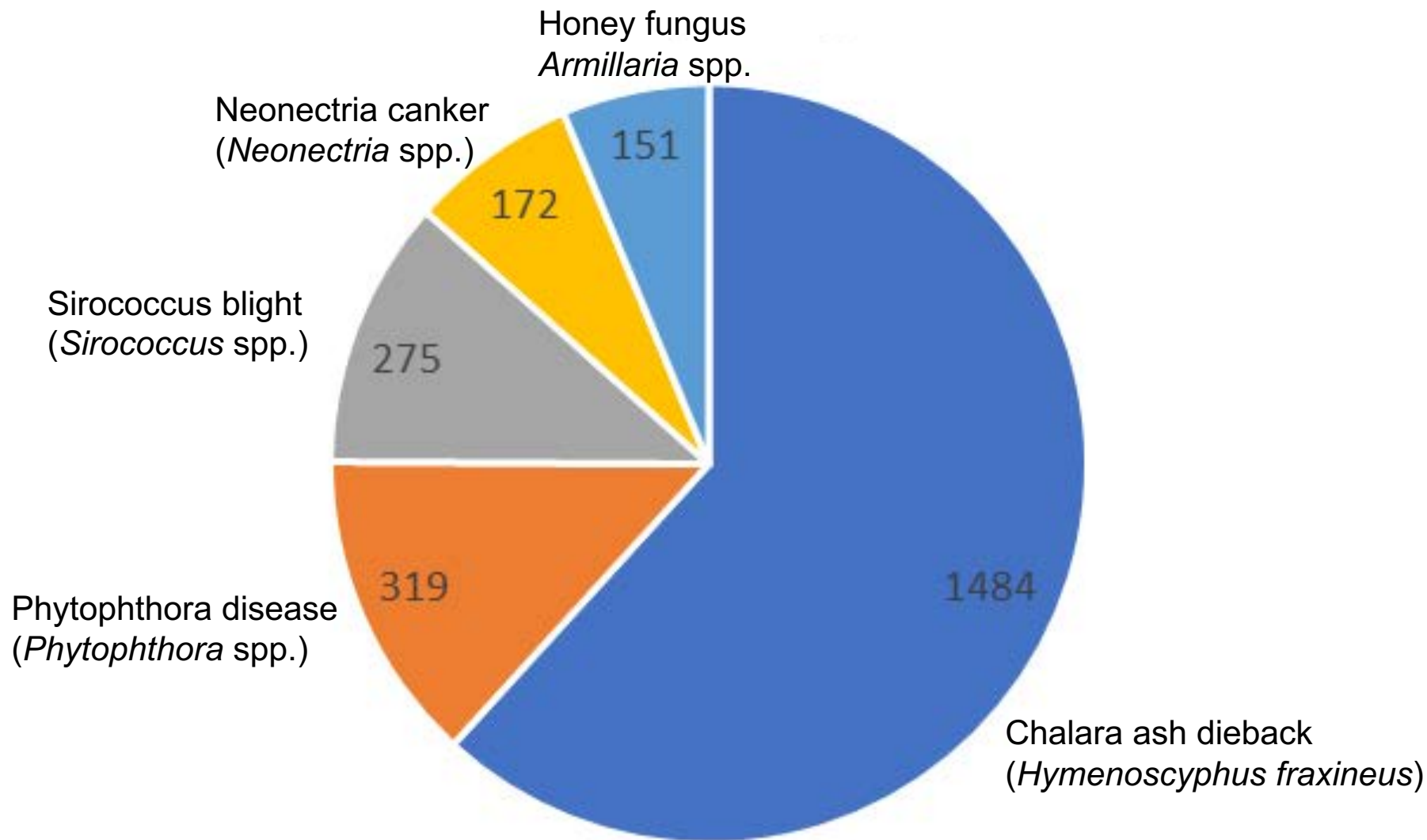
- Reports include over 90 tree genera
- Of these, we had over 100 reports on 21 tree genera:
 - 12 broadleaf trees
 - 9 conifer trees

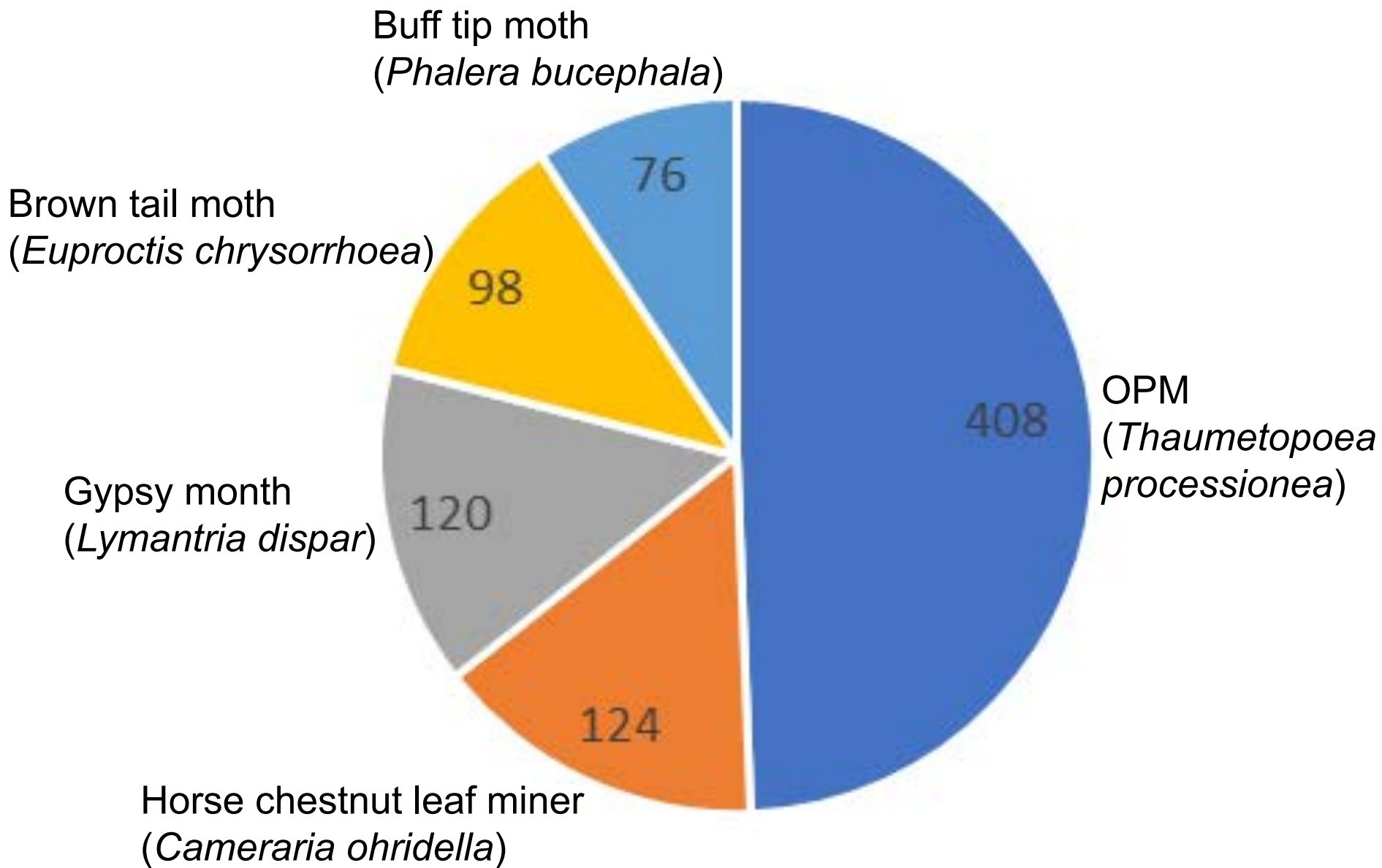
Broadleaf	Conifer
<i>Acer</i>	<i>Abies</i>
<i>Aesculus</i>	<i>Cedrus</i>
<i>Alnus</i>	<i>Chamaecyparis</i>
<i>Betula</i>	<i>Juniperus</i>
<i>Castanea</i>	<i>Larix</i>
<i>Fagus</i>	<i>Picea</i>
<i>Fraxinus</i>	<i>Pinus</i>
<i>Platanus</i>	<i>Pseudotsuga</i>
<i>Quercus</i>	<i>Taxus</i>
<i>Sorbus</i>	
<i>Tilia</i>	
<i>Ulmus</i>	

Chart Title



- Fraxinus
- Quercus
- Cedrus
- Pinus
- Castanea
- Picea
- Aesculus
- Fagus
- Platanus
- Abies



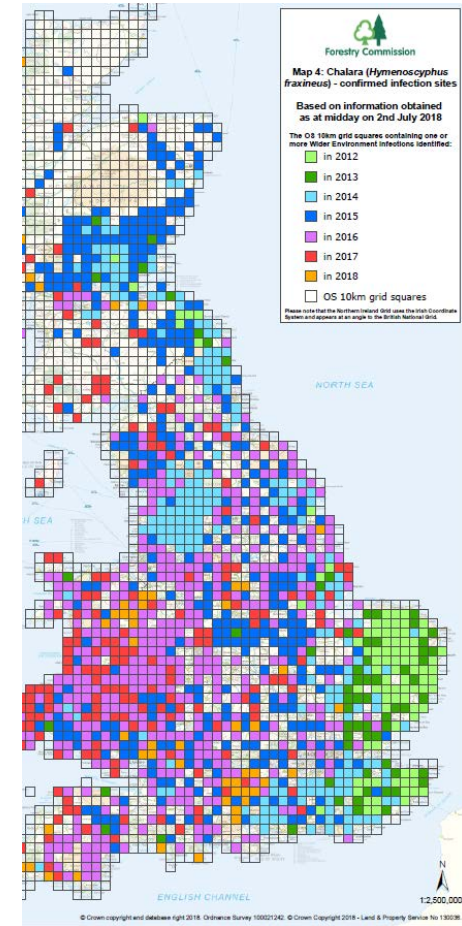
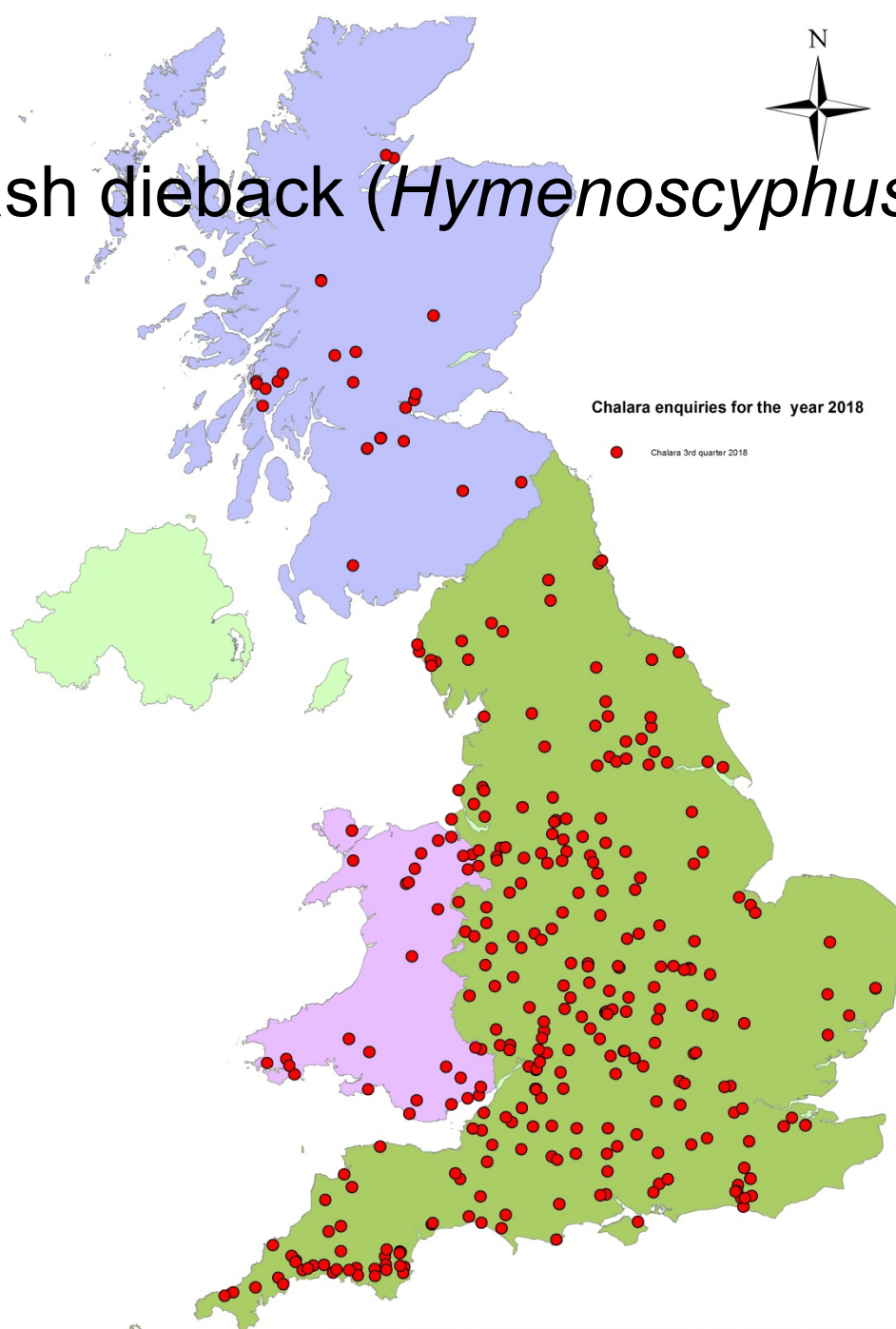
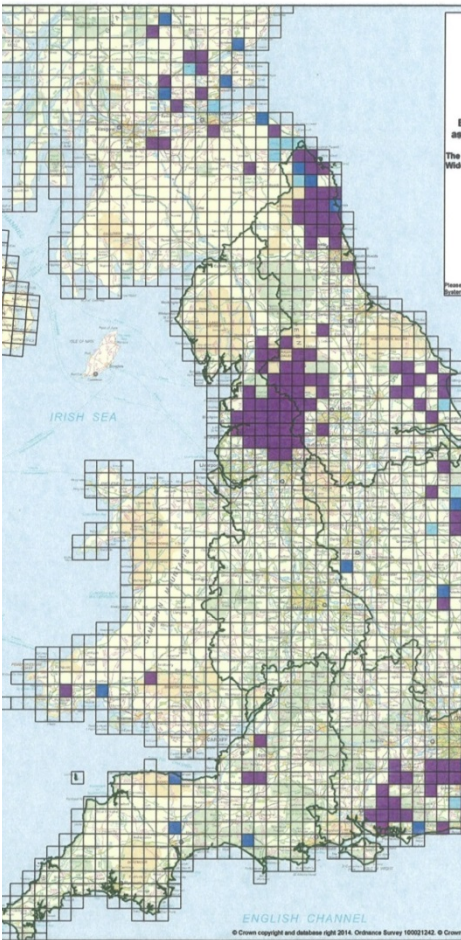




Buff tip moth (*Phalera bucephala*)

Main diseases/pathogens detected on top ten reported hosts

Chalara ash dieback (*Hymenoscyphus fraxineus*)









- *F. albicans*
- *F. americana*
- *F. caroliniana*
- *F. chinensis*
- *F. latifolia*
- *F. mandshurica*
- *F. nigra*
- *F. ornus*
- *F. paxiana*
- *F. pennsylvanica*
- *F. profunda*
- *F. texensis*
- *F. velutina*



F. ornus



F. latifolia



F. mandshurica



F. chinensis

- *Hymenoscyphus fraxineus* was detected on *Phillyrea angustifolia*, *P. latifolia* and *Chionanthus virginicus*
 - All belong to the Oleaceae family, as does *Fraxinus*
 - Subtribe Oleinae (includes *Chionanthus* – fringe tree, *Phillyrea* – mock privet, *Osmanthus* and olive)
- Other members of the Oleaceae family have been tested for susceptibility by other research groups in the past and were found to be not susceptible:
 - forsythia (*Forsythia x intermedia* ‘Lynwood’)
 - privet (*Ligustrum vulgare*)
 - olive (*Olea europaea*)
 - lilac (*Syringa vulgaris*)



Phillyrea latifolia



Phillyrea angustifolia

Chionanthus virginicus

- *Phillyrea latifolia* (mock privet) Species within the Oleaceae family, native to the entire Mediterranean Basin, Portugal to Syria
- *P. angustifolia* is native to western and central Mediterranean Basin, Portugal to Albania
- White fringe-tree (*Chionanthus virginicus*) - native to southern North America
- In our study, the location of these non-ash hosts (*Phillyrea* spp. and *Chionanthus virginicus*) was in the vicinity of many native ash trees with typical symptoms of Chalara dieback (*H. fraxineus*), indicative of high spore levels
- The findings of infection by *H. fraxineus* on *Phillyrea* spp and *Chionanthus* are the first non-ash host records worldwide

- **Main pest reported:**
 - **OPM** (*Thaumetopoea processionea*): Introduced species, a hazard to tree, human and animal health. Can be a major, but localised, defoliator of oak.

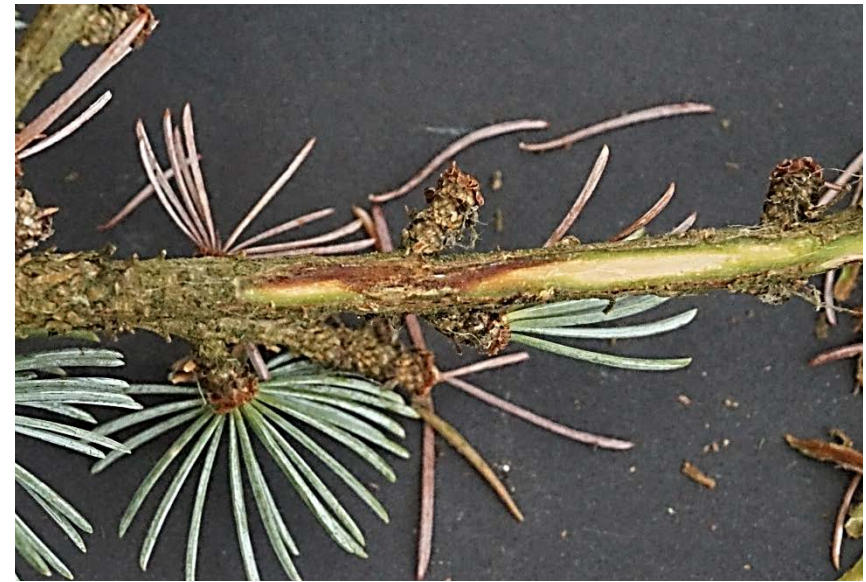


- **Other pests and diseases:**
 - *Armillaria*
 - *Phytophthora*
 - Powdery mildew
 - Acute oak decline
 - Moths: buff-tip moth (*Phalera bucephala*), brown-tail moth (*Euproctis chrysorrhoea*), gypsy moth (*Lymantria dispar*), Lackey moth (*Melacosoma neustria*)
 - Galls

- Sirococcus blight (*Sirococcus tsugae*)



Lesions and cankers on affected shoots





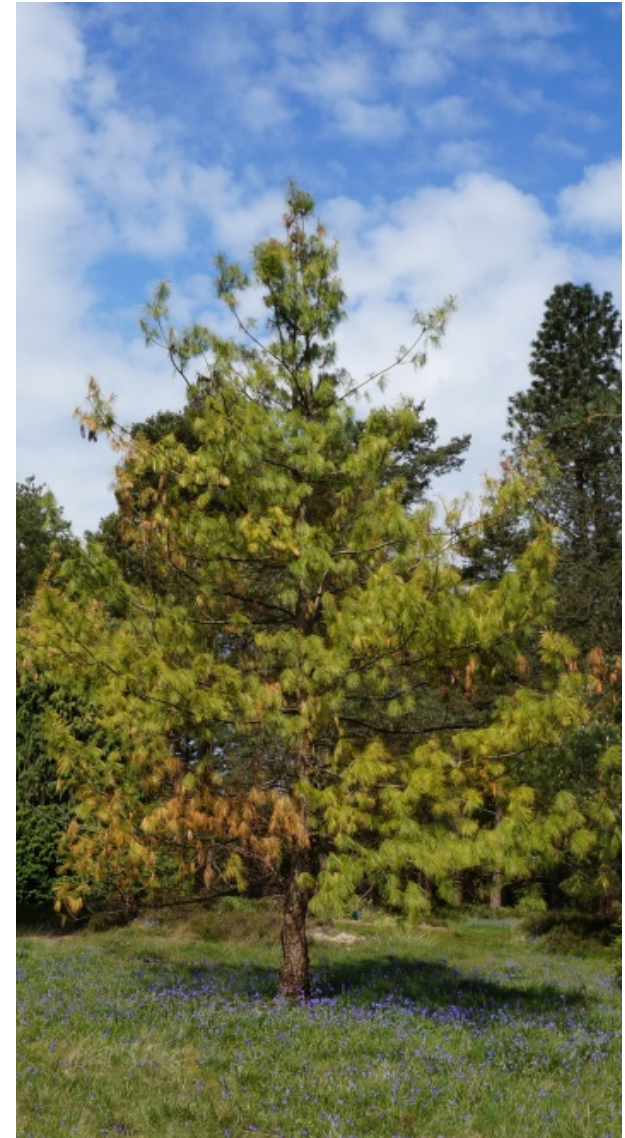
(Pérez-Sierra *et al.* 2014)



Dothistroma septosporum



Diplodia sapinea



Phytophthora cinnamomi



Armillaria sp.



Heterobasidion annosum

Image courtesy of Matteo Maspero & Phytosanitary Service of the Region of Piedmont, Italy



Oriental chestnut gall wasp (*Dryocosmus kuriphilus*): Detected in the Britain in 2015 (Morath *et al.* 2015)

(Photo: H. Carter FC)



Canker caused by *Gnomoniopsis smithogilvyi* Detected in Britain in 2016 (Lewis *et al.* 2017)



Chestnut blight (*Cryphonectria parasitica*)



Chestnut blight (*Cryphonectria parasitica*)



Chestnut blight (*Cryphonectria parasitica*)



Chestnut blight (*Cryphonectria parasitica*)



Great spruce bark beetle
(*Dendroctonus micans*)



Neonectria fuckeliana



Green spruce aphid (*Elatobium abietinum*)

Horse chestnut leaf miner (*Cameraria ohridella*):
Exotic species first recorded in 2002. Now
widespread throughout England and Wales to the
north.





P. cambivora, *P. gonapodyides*, *P. plurivora*, *P. ramorum*, *P. pseudosyringae*
P. chlamydospora x *P. gonapodyides*,



Meripilus giganteus



Kretzschmaria deusta



Armillaria mellea



Pseudoinonotus dryadeus



Anthracnose
(*Apiognomonia veneta*)



Perenniporia fraxinea



Fomitiporia mediterranea



Powdery mildew
(*Erysiphe platani*)



Massaria disease
(*Splanchnonema platani*)



Kretzschmaria deusta



Inonotus hispidus



Meripilus giganteus



Rigidoporus ulmarius



Pholiota squarrosa



Different fungi isolated:



Diaporthe neotheicola, *Neofusicoccum parvum*, *Diplodia mutila*, *Eutypa lata*

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Urban London plane tree dieback linked to fungi in the Botryosphaeriaceae

Pegah Pelleteret, Julien Crovadore, Bastien Cochard, Sabrina Pasche, Pierre-Yves Bovigny, Romain Chablais, François Lefort*

Plants and Pathogens Group, Institute Land Nature and Environment, hepia, HES-SO University of Applied Sciences and Arts Western Switzerland, 150 route de Presinge, 1254 Jussy, Geneva, Switzerland



ARTICLE INFO

ABSTRACT

First report of stem die-back on *Platanus x acerifolia* caused by *Neofusicoccum parvum* in China (Plant Disease)







Neonectria canker (*Neonectria neomacrospora*)



Neonectria canker (*Neonectria neomacrospora*)



- Elm zigzag sawfly (*Aproceros leucopoda*)
- Eight-toothed spruce bark beetle (*Ips typographus*)
- Oriental chestnut gall wasp (*Dryocosmus kuriphilus*) on sweet chestnut

- Chestnut blight (*Cryphonectria parasitica*) on sweet chestnut
- *Fomitiporia medieterranea* on plane trees
- *Gnomoniopsis smithogilvyi* on sweet chestnut
- *Heterobasidion abietinum* on *Tsuga heterophylla* and *Abies grandis*
- *Hymenoscyphus fraxineus* on non-ash hosts
- *Phytophthora foliorum* on *Rhododendron*
- *Phytophthora siskiyouensis* on *Alnus incana*
- *Sirococcus castaneae* on sweet chestnut
- *Sirococcus tsugae* on cedars and hemlocks

Phytophthora infestations in European nurseries

A sample of 732 nurseries in 18 European countries showed that nearly all — 91.5% — had at least one species of *Phytophthora*. Appropriate planning and careful sourcing can minimise the amount of infected stock and ensure that only healthy trees are planted.

(King et al., 2015)

The impact of dirty tools

Disease can be spread on our tools. In a Brazilian study, plots of unharvested eucalyptus had only a 2.7% occurrence of *Ceratocystis* wilt, but harvested plots had 39.7%. This suggests the disease had been spread on infected harvesting tools. In a USA study, *Ceratocystis platani* infected 40% of wounds made by saws previously used on diseased trees. Rates increased to 50% for climbing ropes.

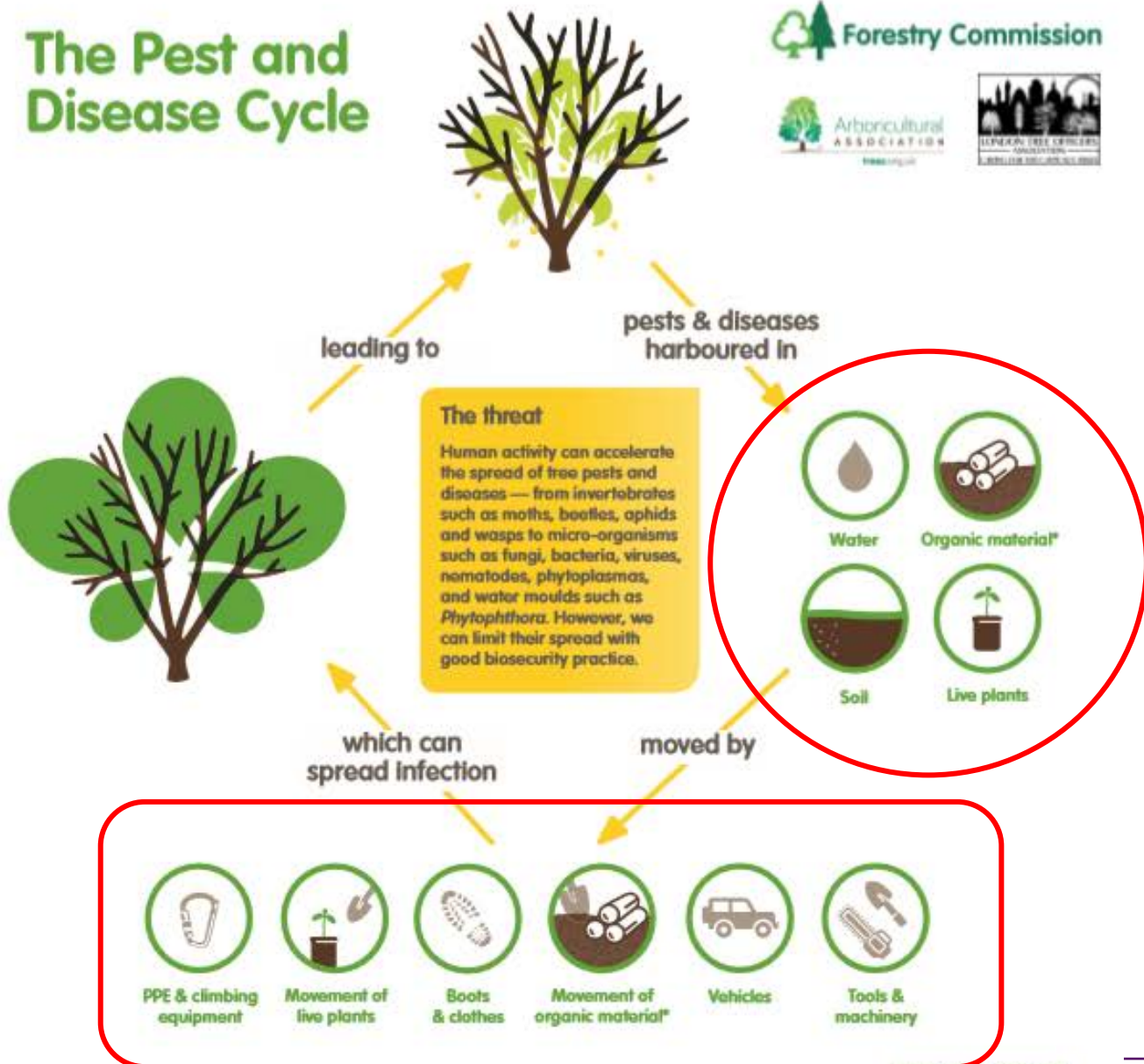
(Ferreira et al., 2012) (Walker, 2004)

Clean start, every day

In a study of seven sites, the rate of tree infection by *Phytophthora lateralis* reduced over 12 years from 29% to 0% where vehicles and boots were washed. Sites where no washing was done saw only limited reductions.

(Gibson et al 2012)

The Pest and Disease Cycle





Don't give
pests and
diseases
an easy ride

Before you head out on site today, remember:



Think Kit

- Remove soil and debris from boots, clothing and kit before leaving any site
- Clean and disinfect chainsaws and other cutting tools
- Clean machinery regularly and think about where it is positioned on site



Think Transport

- Make a clean start, every day
- Remove build-up of soil and debris on vehicles before leaving any site
- Use proper off-site wash-down facilities regularly



Think Trees

- Source plants responsibly
- Keep records of purchases and suppliers
- Keep an eye out for signs of ill health



...shoes, paws
and wheels
help control
forest diseases



DON'T RISK IT!

**Pests and diseases can hide on plants.
Please do not bring home plants,
seeds, fruit, vegetables or flowers.**



This poster was developed by the Forestry and Woodland Plant Protection Organisation (FWPPPO) under grant aid administered with the Rural Development Plan, 2014 - 2020. © Forestry Commission 2014.



- Suspect trees can be reported
- Symptom check list, location
- Images can be uploaded
- Well evidenced sites will be checked out

<https://treealert.forestresearch.gov.uk/>

Tree Health Diagnostic and Advisory Service

Reviewing the past six years

Ana Pérez-Sierra, Max Blake, Caroline Gorton, Alex Lewis, Ruth Chitty, Sietse van der Linde, Thomas Kendall, Lucy Turner, April Armstrong, Steven Hendry*

Since 2013 the Tree Health Diagnostic and Advisory Service (THDAS) at Forest Research (FR) has dealt with over 13,000 enquiries. In this article, we explain how the THDAS works by answering a series of questions and summarising what has been uncovered by responding to enquiries.

The THDAS (www.forestresearch.gov.uk/services/tree-health-diagnostic-and-advisory-service/) provides impartial advice, and where possible, diagnosis and identification of pests and pathogens on trees in Great Britain. The service has been running since the 1960s, and enquiries and samples are received from across Great Britain and occasionally further afield. The team of diagnosticians, entomologists and pathologists is located at FR's two main research stations – the Northern Research Station (NRS) in Scotland and Alice Holt (AH) in southern England.

How does THDAS fit into the bigger picture of Tree Health? The role of THDAS is to gather information about the health of the nation's trees (individually or in woodlands and forests), to assess findings and identify trends in pest and pathogen occurrence and spread, and

to contribute towards the management of these through providing advice to owners, managers and the relevant authorities. THDAS acts as an early warning system for tree health; if pests or pathogens are detected and reported early, there is a greater prospect of managing or controlling them.

Is THDAS interested only in new and emergent pests? The answer is no: THDAS is interested not only in new pests and pathogens but also in occurrence of and trends in the common ones which may change in importance due to environmental changes. There are also potentially 'unknowns' – not identified as a threat today but perhaps the new problems of tomorrow. This is why we encourage the reporting of any concern about trees: it is better to have information to reassure enquirers that there is no cause for alarm or their problem is commonplace

*Ana Pérez-Sierra, Max Blake, Caroline Gorton, Alex Lewis, Ruth Chitty, Sietse van der Linde, Thomas Kendall and Lucy Turner are at Forest Research, Alice Holt Lodge, Farnham, England; April Armstrong and Steven Hendry are at Forest Research, Northern Research Station, Bush Estate, Roslin, Scotland.

than to miss a possible new threat to British trees because of under-reporting.

How does THDAS work? Enquiries reach THDAS by different routes. Our preferred route is use of TreeAlert (treealert.forestresearch.gov.uk/) – a specially designed portal which helps the enquirer provide the essential information. TreeAlert was initially developed as an app by the Forestry Commission (FC) following the outbreak of Chalara ash dieback in 2012 but was redeveloped in 2015 as a web-based tool to permit the reporting of any pests or diseases on any tree in Great Britain. It is now a valuable tool for forestry, tree professionals, Observatree volunteers (www.observatree.org.uk), and anyone who cares about Britain's trees and woodlands and wants to help us tackle pests and pathogens.

Over the last six years TreeAlert has been the origin of 57% of the total number of enquiries, followed by email (15%), letter (15%), site visits (3%), telephone (3%), visitors (3%) and others (7%) (Fig. 1).

What happens to the submitted reports?

The reports are checked daily by the THDAS team and are triaged, with priority given to any suspected regulated or quarantine pest or disease. Priority cases may be followed up by the wider Plant Health Service (the respective authorities in England, Scotland and Wales) with whom we closely collaborate; in some cases, diagnosis may be possible based on initial information, whereas in other cases further information (and sometimes samples) may be requested, or a site visit organised.

When and from where are enquiries received? Each year the number of enquiries fluctuates and can be influenced by factors such as weather conditions, new detections or sometimes by press releases related to tree health problems. However, one consistency is seasonality. Most of the enquiries are received between May and August, usually with the highest peak in June. As an example, Figure 2 shows the number of enquiries per month

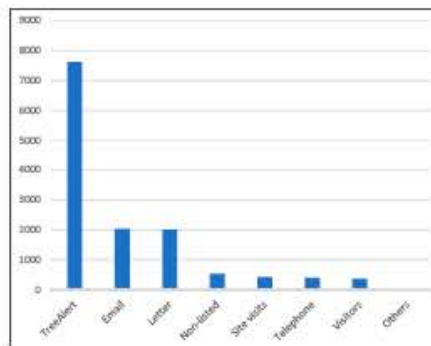


Figure 1. Origin and number of enquiries received at the Tree Health Diagnostic and Advisory Service (THDAS) from 2013 to 2018.

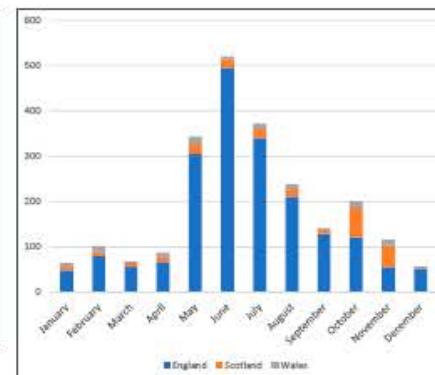


Figure 2. Number of enquiries received per month and per country during 2018 showing the seasonality of the work at THDAS.

Thank you