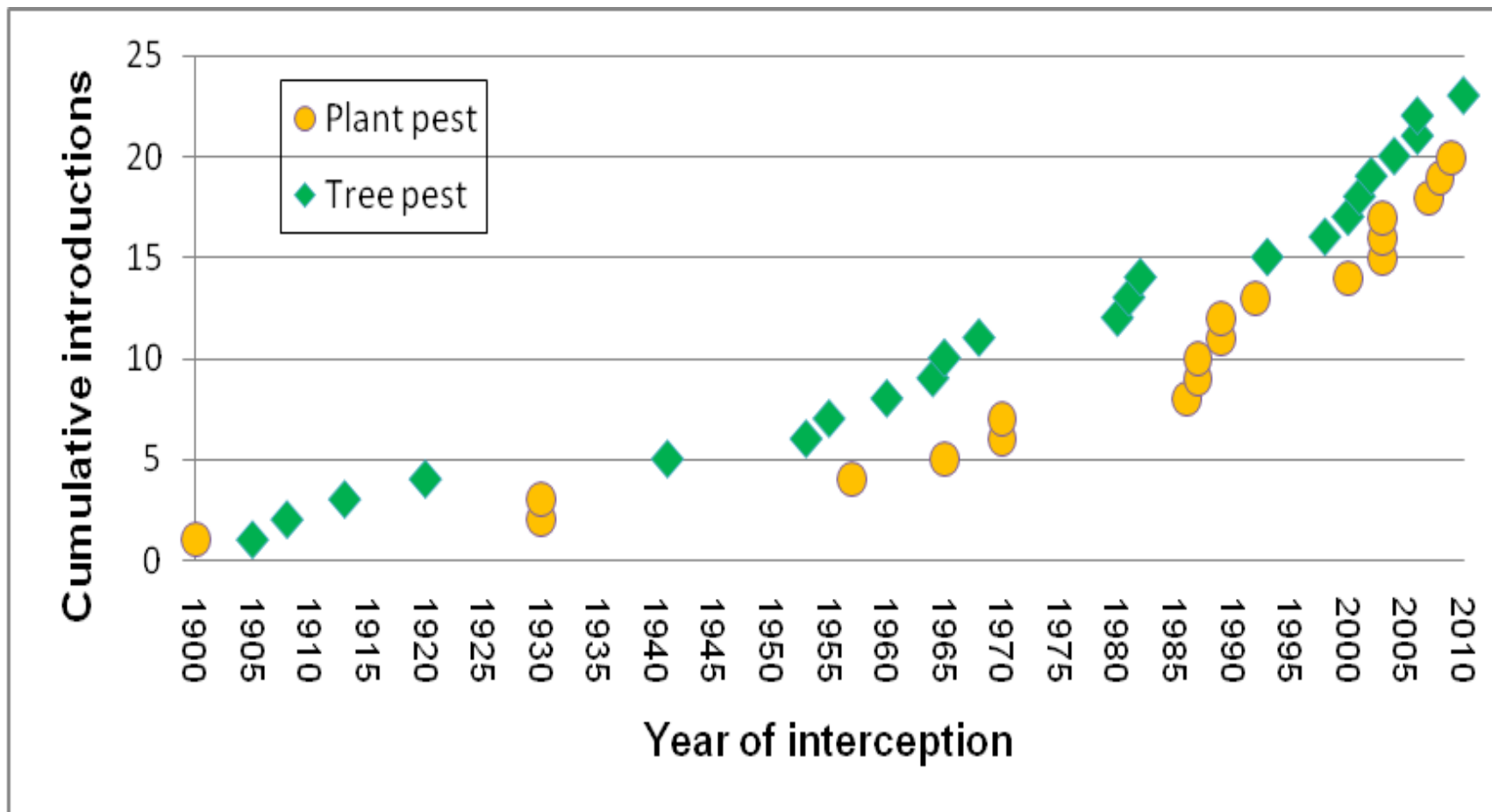


# **New pest and pathogen threats to trees and forests and the UK response**

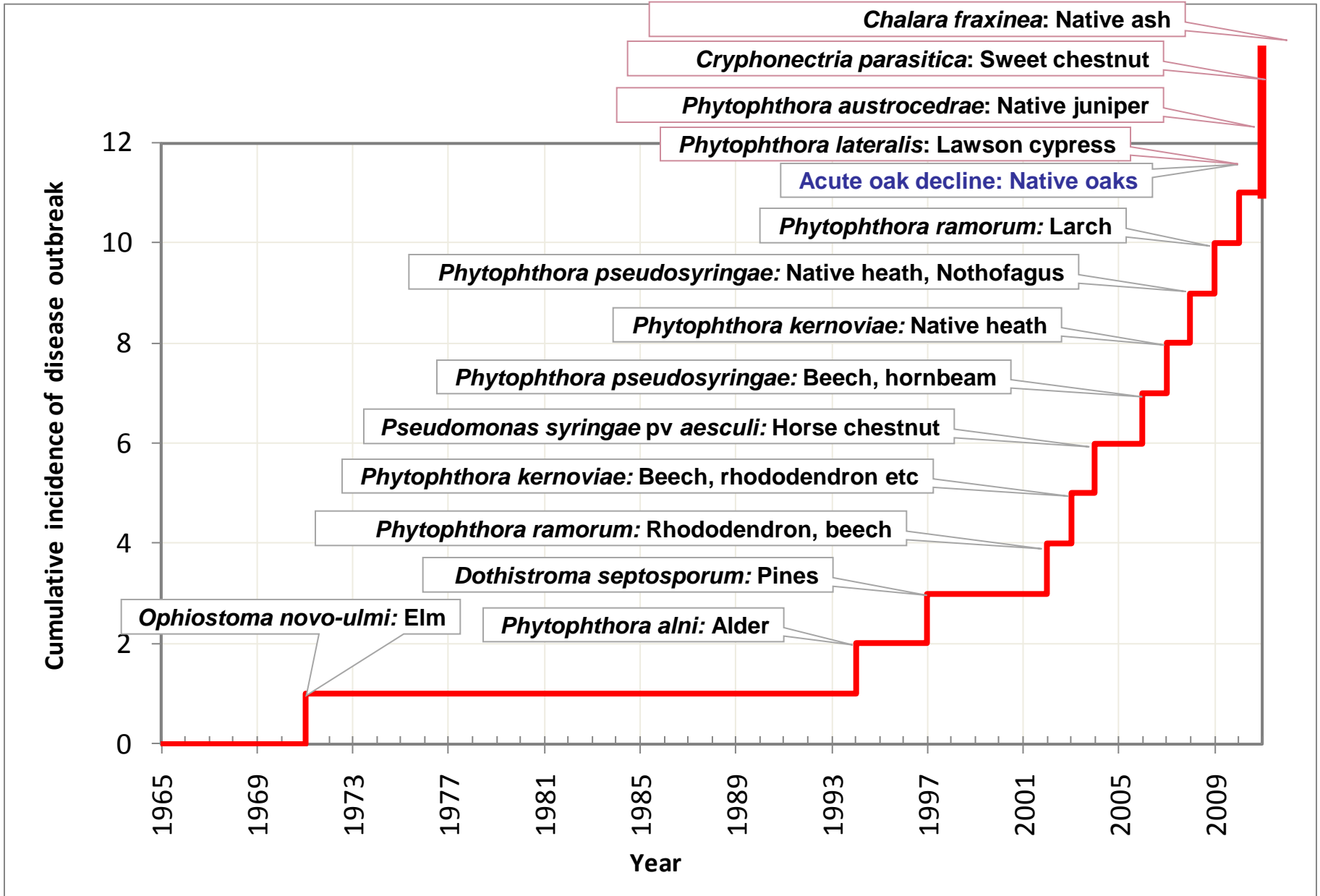
**Joan Webber, Principal Pathologist  
Forest Research**

- Complicated landscape in UK for plant health
  - Forestry Commission takes lead for forest trees
  - Department of Food & Rural Affairs (Defra) takes lead for non-forest trees, plants, nurseries
  - Policy is devolved and operates at a country level (Scotland/ Wales/ Northern Ireland have own administrations)
- Plant health regulation operates at European Union level
  - Common market, so unrestricted movement of plants within the 27 EU countries - but can have protected zones for pest-free countries/regions
  - Number of tree pests that are regulated at EU level is very limited (in contrast to EPPO)

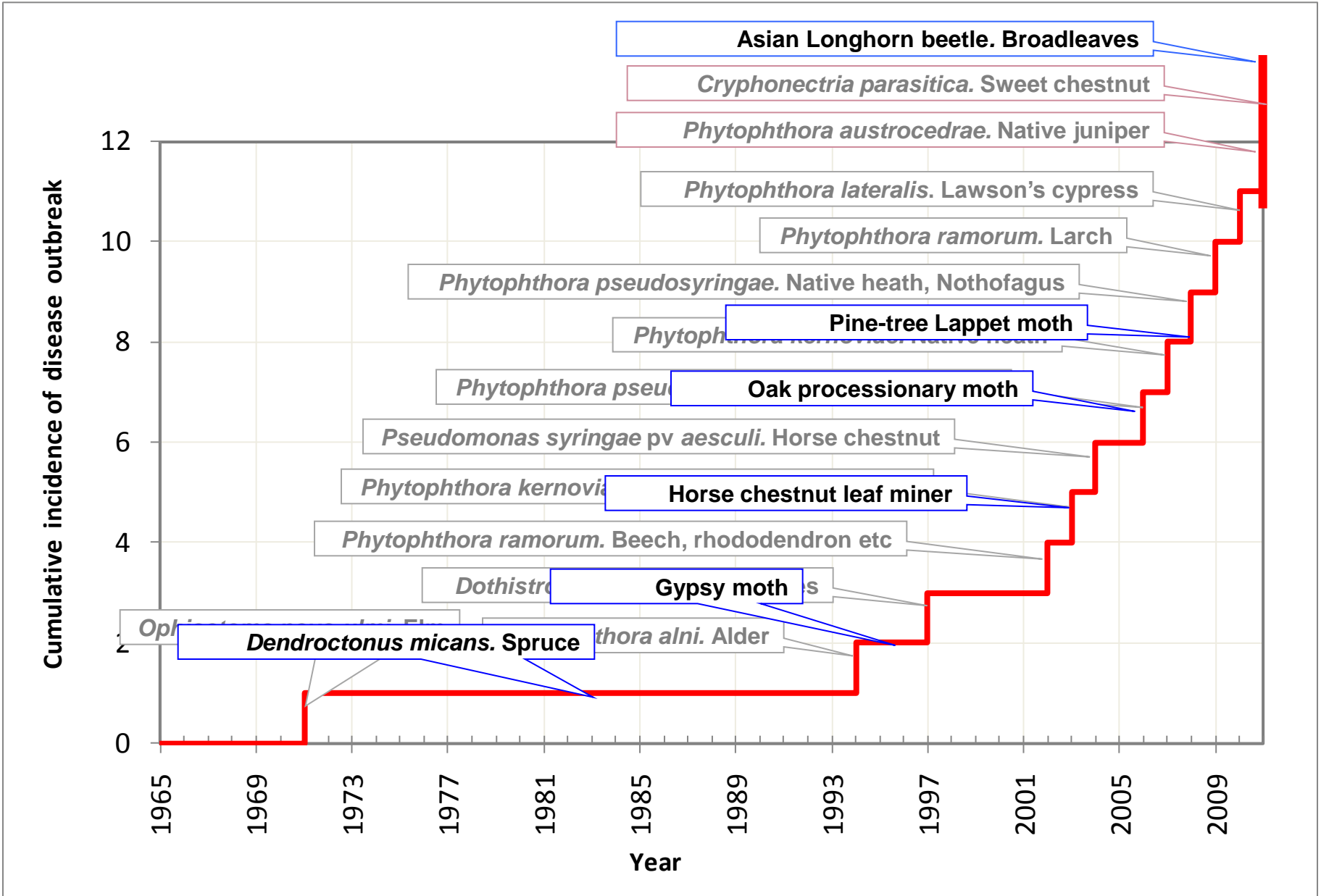
# Arrival of damaging pests and pathogens in Great Britain



- From 2010 onwards -
- Through a process of meetings and consultations, Defra & FC developed an Action Plan to respond to this changing landscape of introduced pest and pathogens
- Plan centres around four main themes
  - Protecting the UK – import controls (also in the context of EU plant health controls)
  - Practical actions (biosecurity practice, local sourcing)
  - Public and stakeholder engagement (awareness, citizen science)
  - Research opportunities and priorities (general resilience, specific targeted topics)



# New tree pest outbreaks UK



## Response to pests and pathogens in the UK

- Oak processionary moth (native in Europe but was absent from the UK: not regulated)
- *Phytophthora ramorum* (limited distribution in Europe: regulated)
- Asian longhorn beetle (non-native but now established in some parts of Europe: regulated)
- Chestnut blight (non-native but now established in much of Europe: regulated)
- Ash dieback (non-native but now throughout much of Europe: regulated)



egg plaque

## Oak Processionary Moth

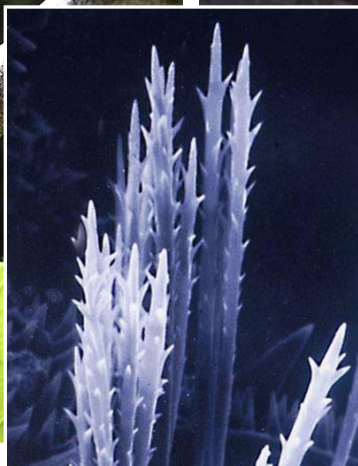
- In 2006, oak processionary moth, *Thaumetopoea processionea* was found at several London locations
- It is a major defoliator of oak in Europe
- Caterpillars feed on the foliage of many species of oaks, including English, sessile and Turkey oak
- Arrived on 4-8 m tall oak imported for street landscape plantings



# Kitzingen, Germany June 2010

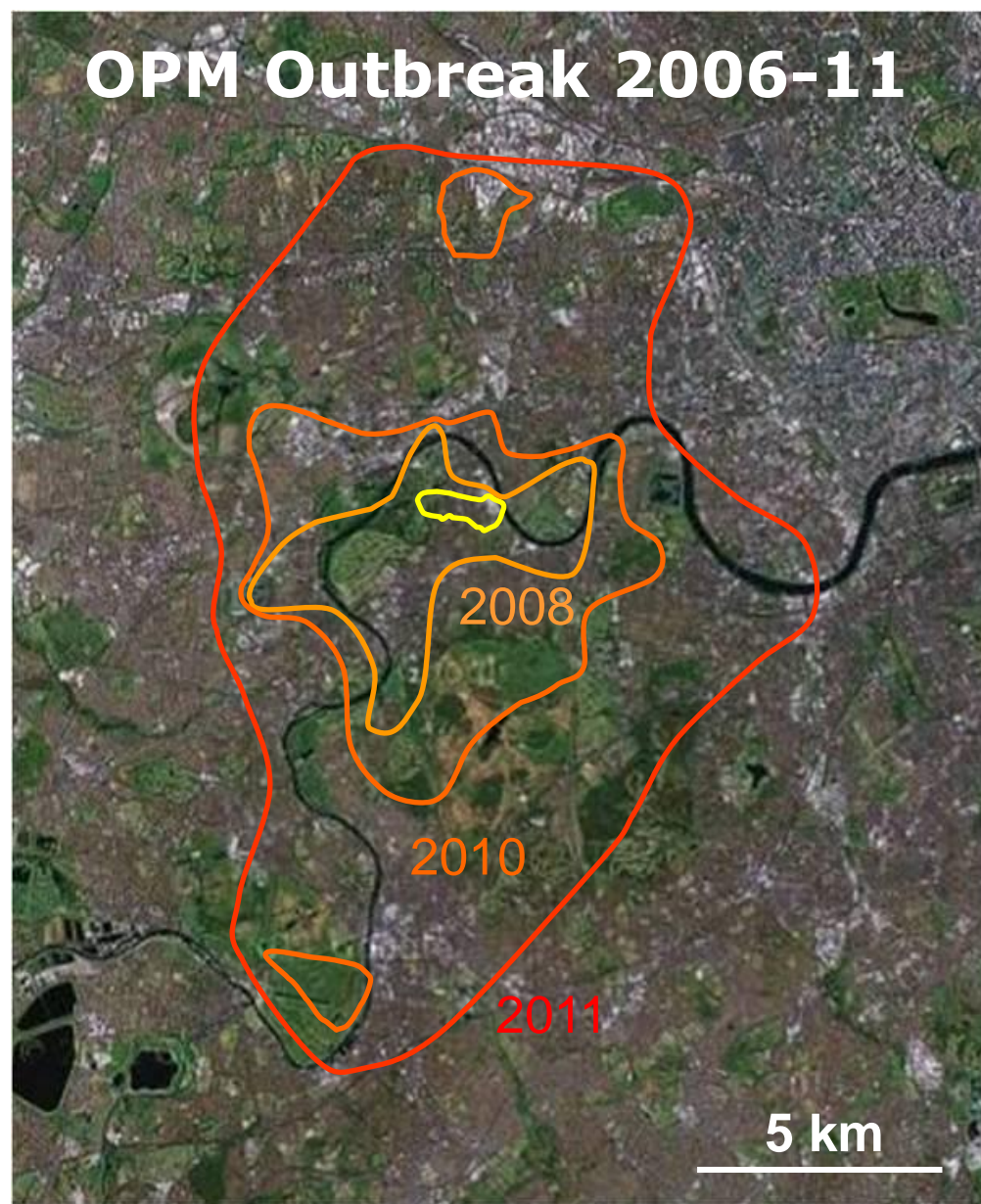


OPM caterpillars carry thousands of tiny irritating hairs that are dislodged on contact. They pose a considerable hazard to public health



0.1 mm

- Changing distribution in Europe, but UK was not a protected zone
- Plant & human health risk
- Eradication efforts since findings in 2006
- Joint response by several 'agencies' Defra, FC, local authorities to the outbreak. Aimed at eradication
- Landowners had to deal with infestations, response was often slow
- On average the population has spread at  $\sim 1\text{km/yr}$ , eradication now abandoned but containment ongoing



Nests 2007	Nests 2008	Nests 2009	Nests 2010*	Nests 2011
<b>708</b>	<b>508</b>	<b>2450</b>	<b>2176</b>	<b>4410</b>

Quercus species affected	Infested trees	% of total
<i>Q. cerris</i>	144	11
<i>Q. robur</i> v. <i>fastigiata</i>	2	0.2
<i>Q. frainetto</i>	1	0.1
<i>Q. x hispanica</i>	1	0.1
<i>Q. x robur</i>	6	0.5
<i>Q. ilex</i>	9	0.7
<i>Q. petraea</i>	4	0.3
<b><i>Q. robur</i></b>	<b>1141</b>	<b>87.2</b>
<i>Q. turnerii</i>	1	0.1

\*\* 44 OPM nests also found at Pangbourne, Berkshire, in August 2010 (arising from a separate introduction)

- Controlling OPM is difficult and costly
- Off-label approval for use of BT
- Increased efforts at containment





Bleeding lesions  
on beech



Inoculum from  
rhododendrons

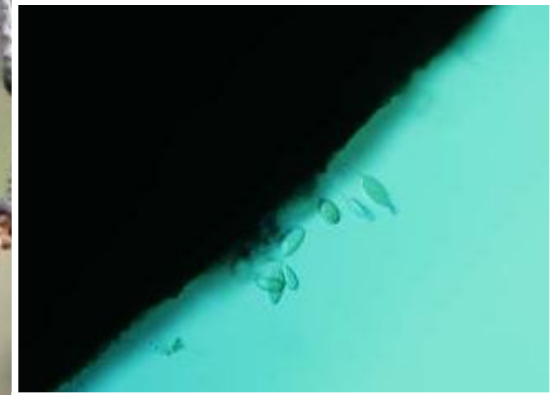


- EU emergency regulation from 2001
- All EU countries required to survey nurseries and wider environment
- Found in UK in nurseries in 2002, on trees in 2003
- Measures in place to eradicate in nurseries, more difficult to reproduce this in the wider environment due to rhododendron invasion
- Costs of plant destruction from owner
- Defra Phytophthora Programme set up in 2009 (5 years, £5 million/year), including cost of rhododendron removal. Aim was to reduce *P. ramorum* to epidemiological insignificant levels
- Joint Fera/FC response

# Emerging findings: Aug-Sept 2009







30/04/10

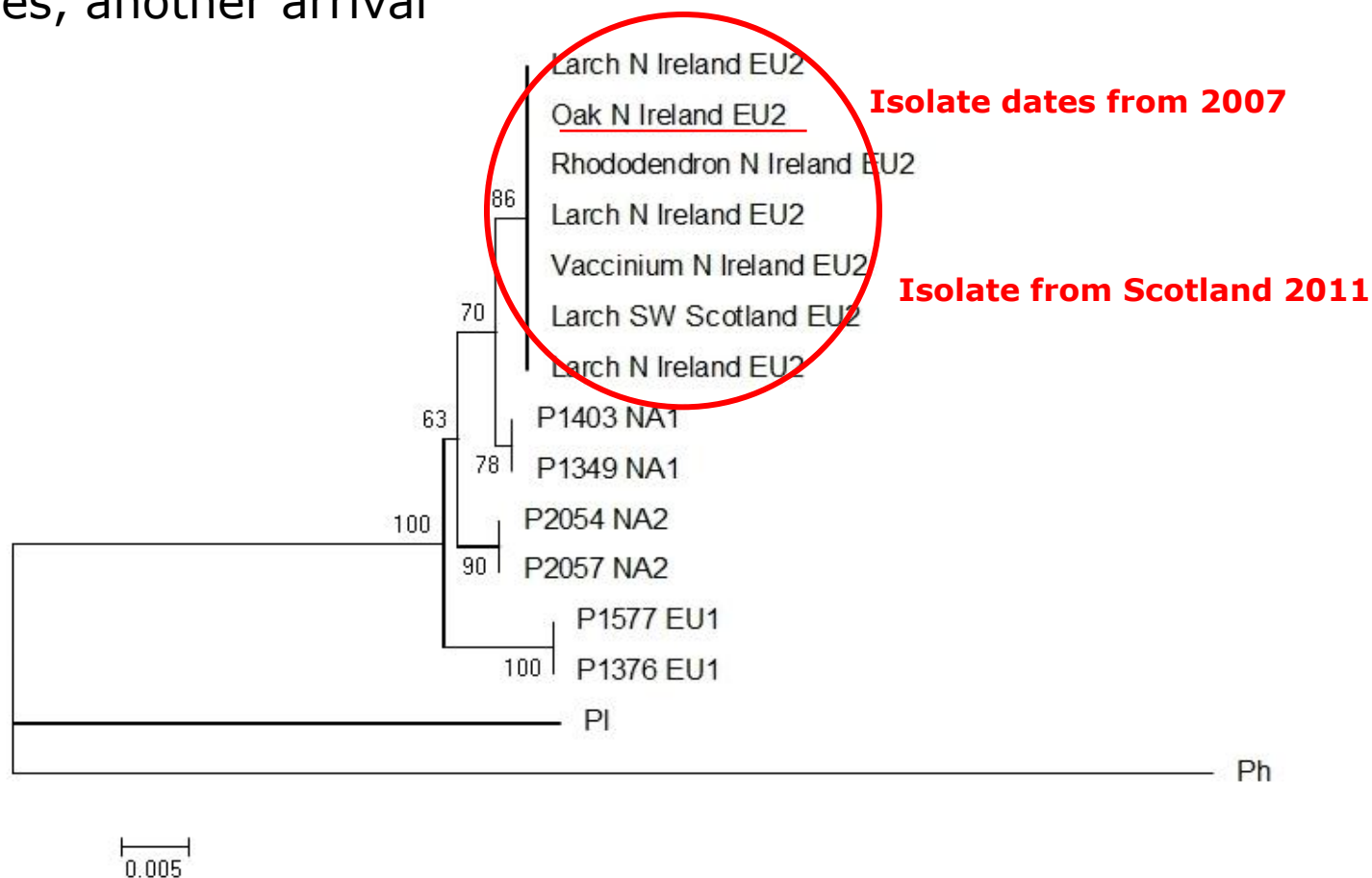


**15/09/10**

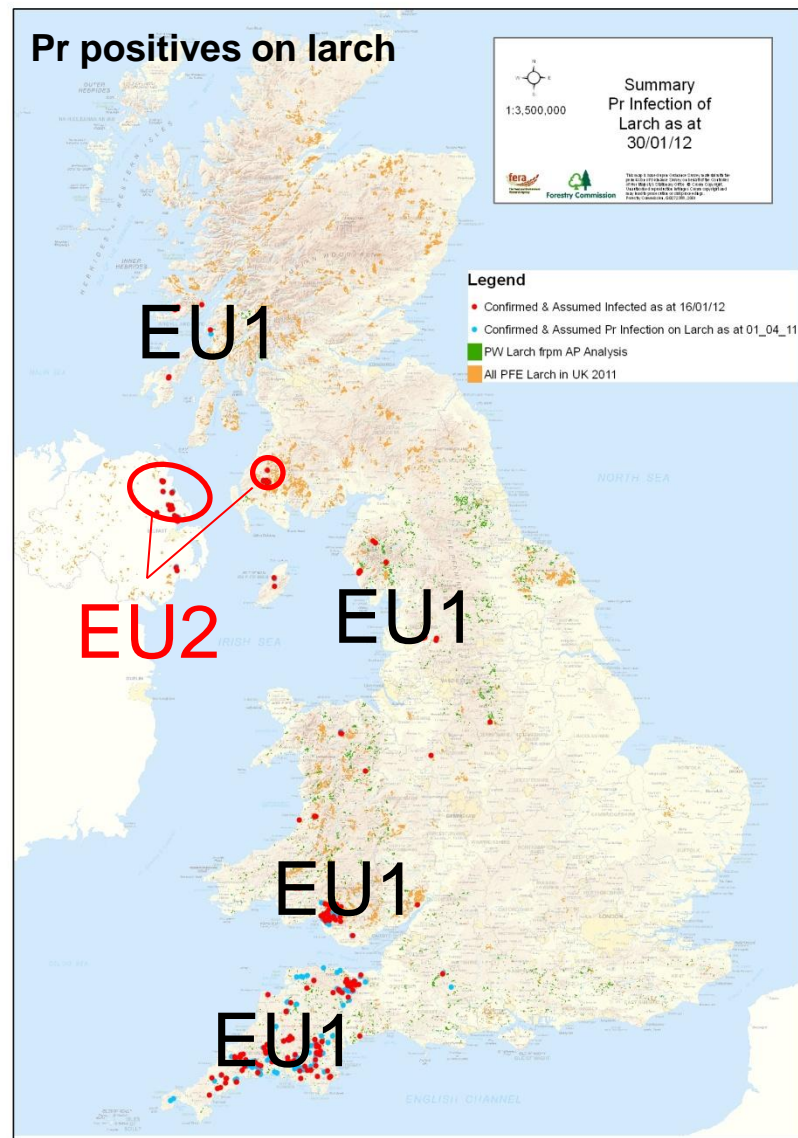
An aerial photograph showing a large, dense forest in the foreground, with a mix of green and brownish trees. In the background, there are several green fields separated by stone walls, with a few scattered trees. The date '15/09/10' is overlaid in the top left corner.

**Aerial flights key part of surveillance**  
**Understanding disease progress**  
**Ensuring compliance**  
**Monitoring for other disorders**

- Analysis of isolates in the FR culture collection (based on five gene sequences) showed a distinct taxon
- Same grouping detected by microsatellite analysis
- Now designated as EU2, new *P. ramorum* lineage
- Despite measures, another arrival



- *P. ramorum* distribution on larch – all infected trees felled (4,000 ha)
- >500 Statutory Felling Notices
- Even in worst affected areas (Devon & Cornwall), 70% larch still healthy
- Timber from infected trees goes to certified processors
- New lineage in two areas & so far not found elsewhere in the UK and Europe
- Pose a different risk to trees and the wider environment compared with more widespread lineage?
- Future post programme in 2014?

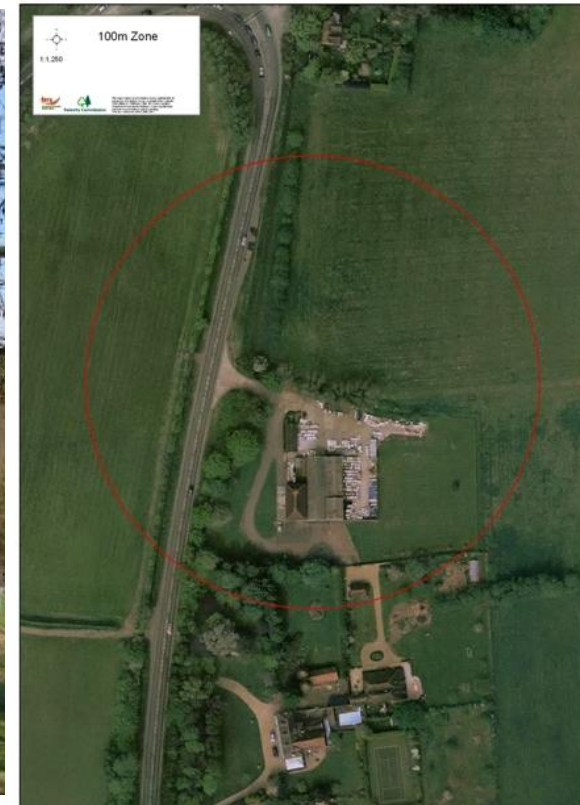


# Asian Longhorn Beetle

- Affects a wide range of broadleaved tree species
- Typically arrives in untreated packaging around stone/slate
- Smaller outbreaks of ALB in France, the Netherlands and Switzerland have been eradicated or are under control



- February 2012 an infestation of ALB was discovered in Kent (south east England), first ALB outbreak in the UK
- Preceded by finding of single adult beetle in 2009, thought to originate from stone importers
- Annual follow up surveys detected the infestation



- Risk well recognised and analysed, regulated organism
- Joint response by Forestry Commission and Defra to the outbreak
- Surveys: 100m, 500m and 1000m
- Usual requirements for costs of eradication to be met by owner of infested material set aside
- Different expertise of FC and Defra crucial to operation









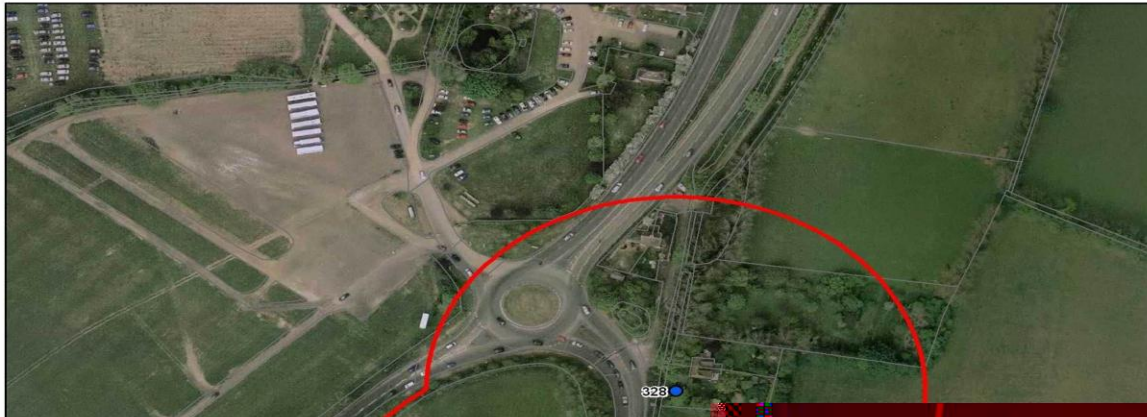


# ALB eradication: March – August



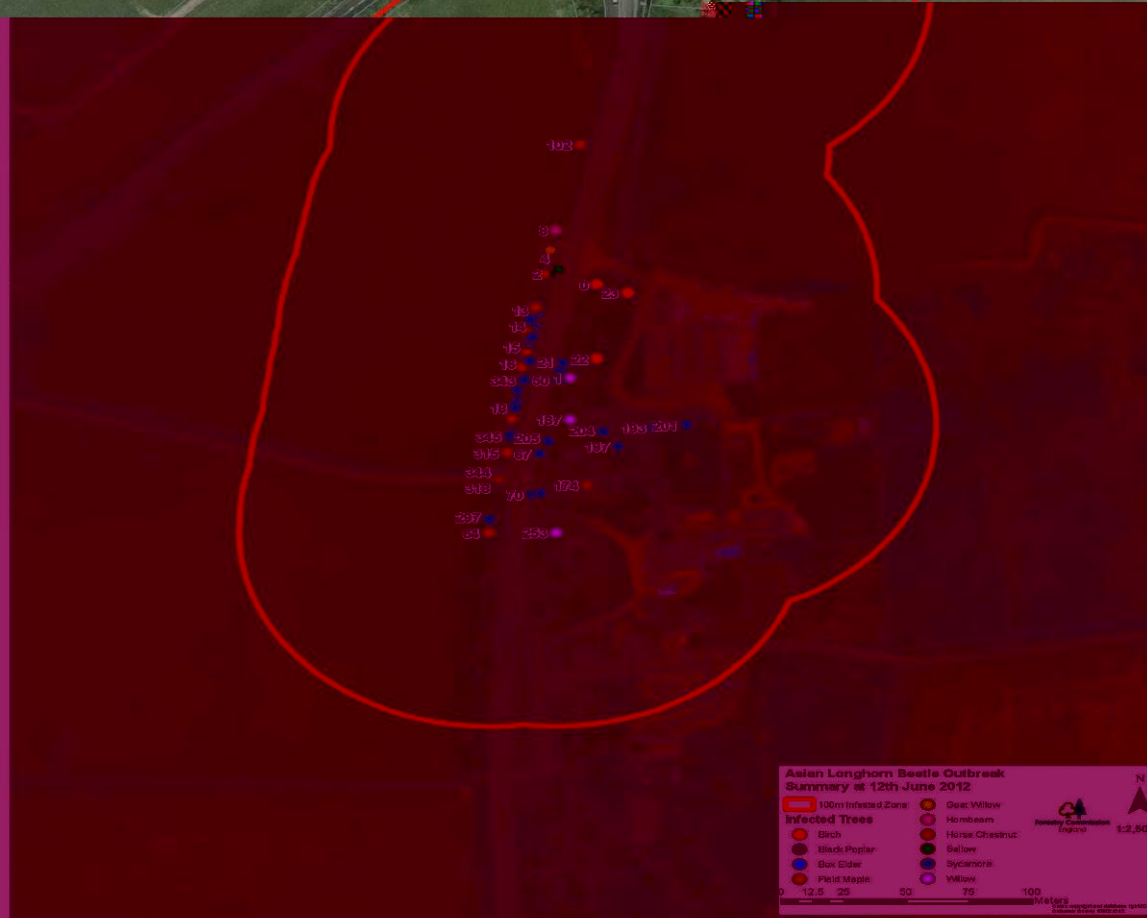
Most frequently affected trees: sycamore, poplar and willow  
All susceptible hosts removed





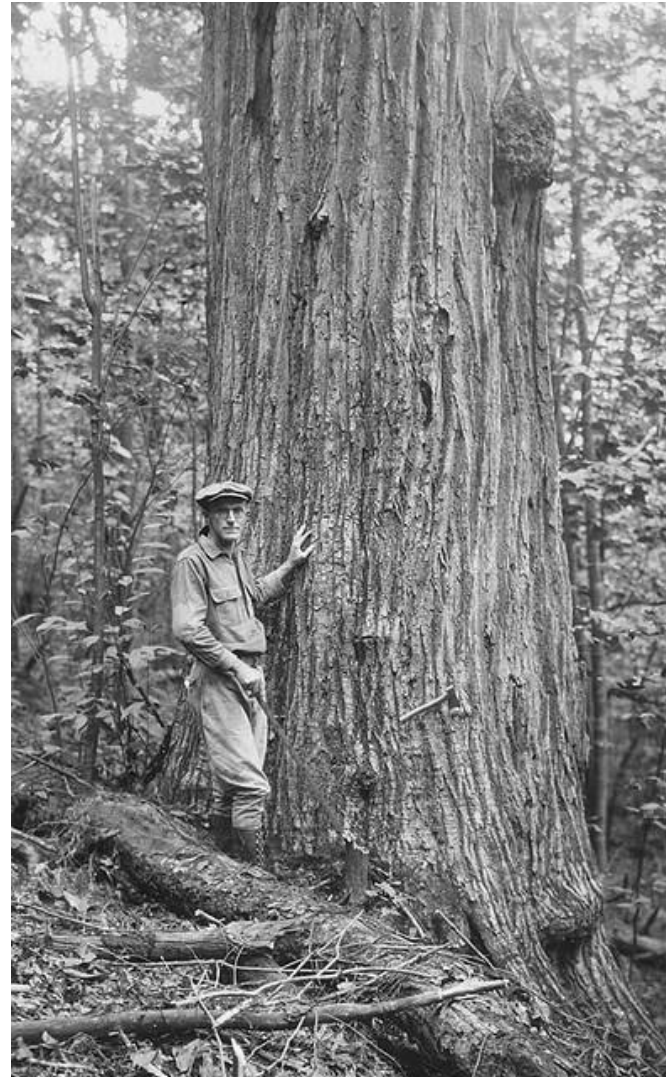
Discovery of ALB in Field Maple adjacent to roundabout has extended outbreak zone northwards

Within outbreak zone  
 >2100 trees felled  
 65 infested trees (10 different tree species)  
 >300 exit holes  
 >200 larvae found in infested material  
 Material analysis on-going to date the infestation



# Chestnut blight

- Causal agent – fungus *Cryphonectria parasitica*
- Quarantine pathogen that has long been regarded as high risk
- EU regulations in place to prevent movement of infected wood/plants to countries free of pest
- Was considered problem of southern Europe, but has spread north
- Only countries free of disease Netherlands, Ireland and UK
- UK equivalent of protected zone



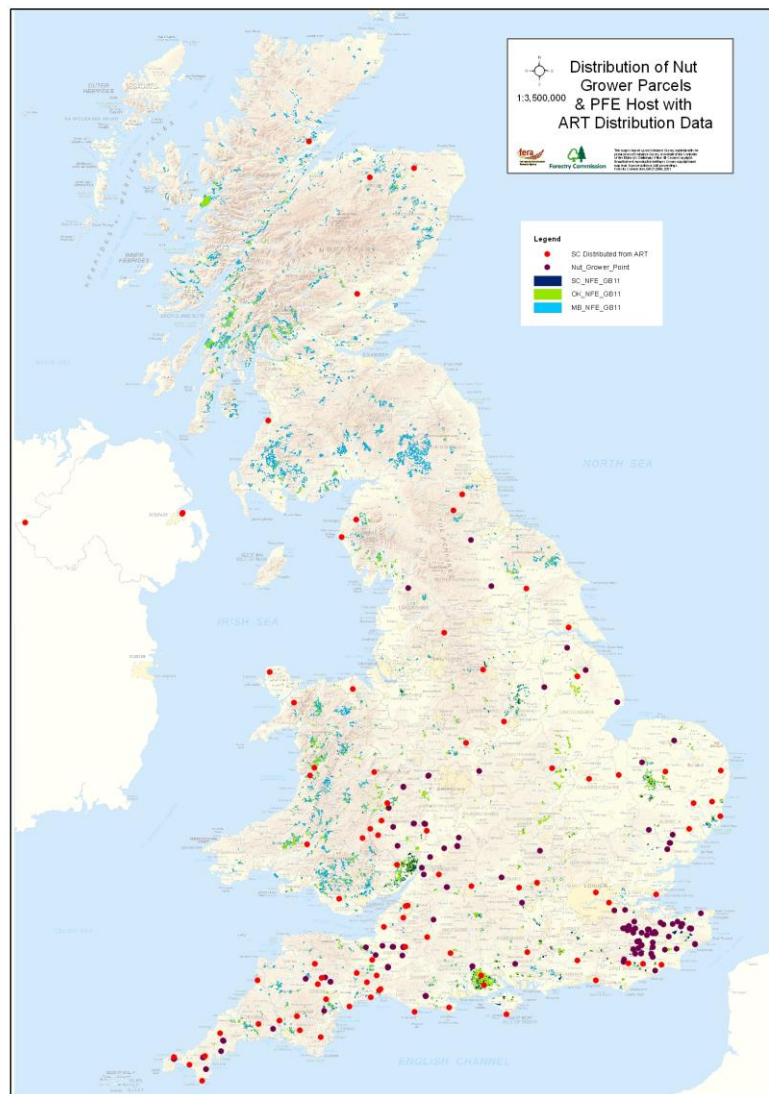






# Potential for spread of chestnut blight in GB?

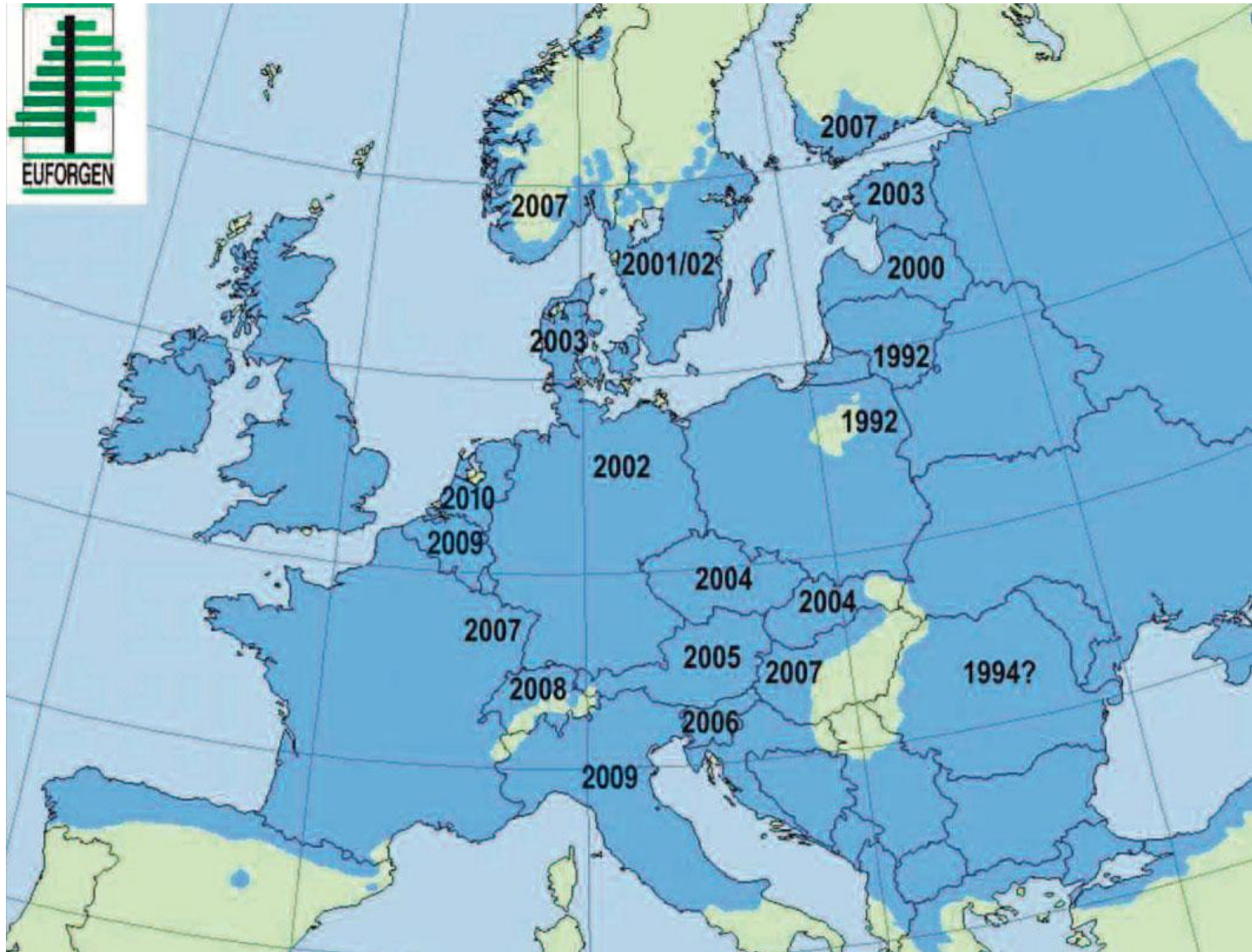
- *Cryphonectria parasitica* – good controls in place for spread in wood (debarking/ inspection)
- But...
  - Increased imports of plants for nut production
  - Lack of awareness about the risks
  - Internet ordering, circumventing controls
- Centralised distribution
- Long latent period before infection shows up
- Since October 2011, nine more outbreaks confirmed (most recent March 2013), all recent plantings



# Ash dieback in Europe – *Chalara fraxinea*

- Emerged as an entirely new disease in Europe in the 1990s, initially cause was unknown – frost and drought both implicated in dieback symptoms
- Realisation that a pathogen was involved came in early 2000s
  - causal agent (*Chalara fraxinea*) named in 2006
  - other name – *Hymenoscyphus pseudoalbidus* in 2010
- Early impact Poland, Lithuania, then Scandinavian countries
  - Some countries 60-90% ash **affected** eg Denmark
- Despite impact & spread not designated as quarantine organism





*H. pseudoalbidus* fruit bodies on fallen ash rachises produce ascospores



Images courtesy of I Thomsen and L McKinney

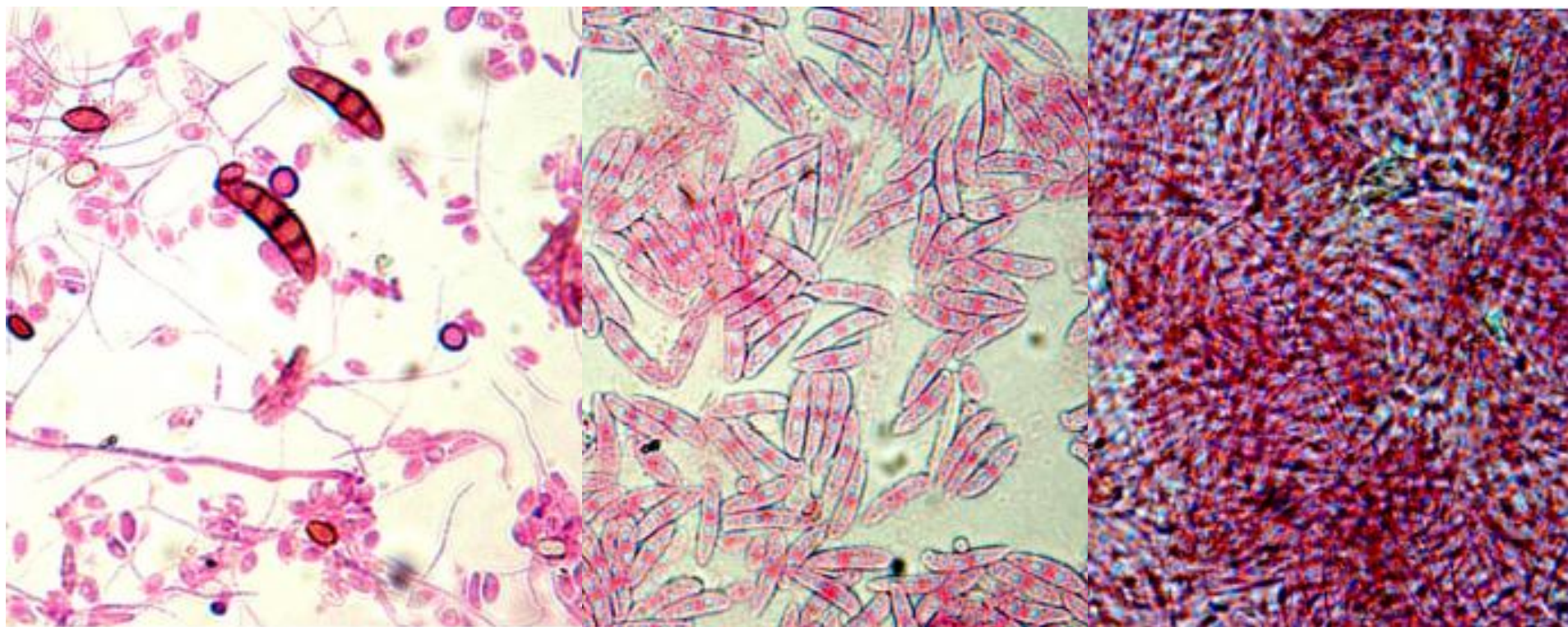
# Spore release of *Hymenoscyphus pseudoalbidus*

Early in the morning peaking between 6-8 am during summer

Spore numbers at night

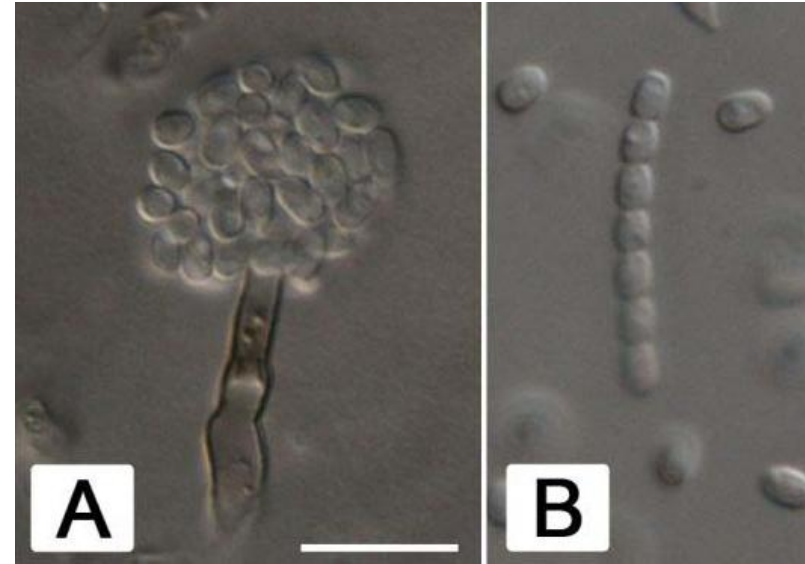
Spore numbers at 5am

Spore numbers at 7am



Work of Halvor Solheim, Volkmar Timmermann & Isabella Berja, Skog og Landskap, Norway

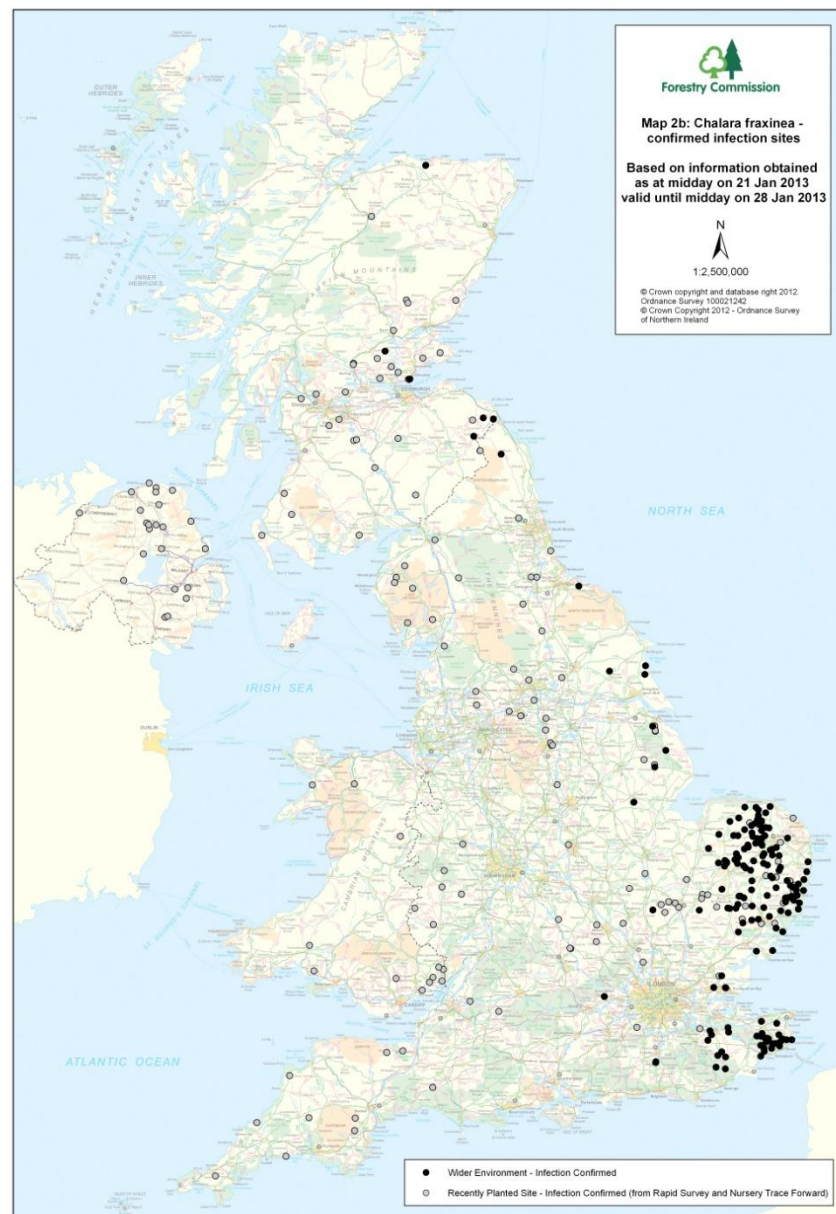
- First finding March 2012 in a nursery – trees imported from Netherlands
- Next finding in May – trees planted winter 2011/12 in a car park near Leicester
  - ~ 500 trees planted
  - About half symptomatic
  - Home grown, UK seed source
  - Lack of awareness about the risk from *Chalara fraxinea*



Chalara spores: Photo courtesy of Ogris et al. (2009)

- First evidence suggested Leicester outbreak not directly related to imported plants
- Plants also distributed to around 40 other locations
- Following this, other nursery findings, but also confirmed outbreak in Scotland (woodland planting 3+ years ago)

- Survey in early Nov 2012
- Continued findings of affected sites
- 170 in wider environment
- 202 recently planted sites
- 19 nurseries (not shown)
- **391 Total**
- Findings...
  - Positives mainly in Kent, Norfolk and Suffolk
  - Further north along the east coast into Hull, Middlesborough and Northumberland
  - East Scotland up to Elgin



	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Total</b>
Belgium	30,000	7,800	11,000	400	0	15,000	47,200	32,500	136,000	279,900
France	155,125	7,000	400	22,200	0	0	700	0	1,000	186,425
Germany	553,600	500,700	81,000	196,500	374,500	396,750	0	400,400	250,750	2,754,200
Hungary	0	0	0	0	0	0	4,625	0	0	4,625
Ireland	0	0	0	27,000	180,600	98,600	162,825	500	0	469,525
Netherlands	0	0	196,500	323,300	205,050	461,607	141,100	50,100	172,375	1,550,032
<b>Total</b>	<b>738,725</b>	<b>515,500</b>	<b>288,900</b>	<b>569,400</b>	<b>760,150</b>	<b>971,957</b>	<b>356,450</b>	<b>483,500</b>	<b>560,125</b>	<b>5,244,707</b>

- Number of UK imported ash plants (bare rooted) from EU Member States registered on the Forest Reproductive Material database
- Ash is the third most frequently broadleaved species in UK

 indicates when disease reported from country



<b>Highly susceptible</b>	<i>Fraxinus excelsior</i>
	<i>Fraxinus angustifolia</i>
	<i>Fraxinus niger</i>
<b>Moderately susceptible</b>	<i>Fraxinus pennsylvanica</i>
<b>Least susceptible</b>	<i>Fraxinus americana</i>
	<i>Fraxinus ornus</i>
	<i>Fraxinus mandschurica</i>

**Some signs of some resistance in populations of *F. excelsior* in Europe**

- Imports of ash currently banned, extended PRA
- Long distance spread, plant trade pathway
- Wind borne spores could have allowed spread from mainland Europe, evidenced by location of some affected sites?
- Now discovering infection may date back at least 4 years
- Huge media interest, political challenges
- Defra Chief Scientist has set up Chalara task Force
- Recently revised management plan  
<http://www.defra.gov.uk/publications/2012/12/06/pb13843-chalara-control-plan/>
- Much greater focus on plant imports from Europe
- Role of citizen science

# Tree A!ert

Chalara Dieback sighting reporter



- App or on-line reporting
- Suspect ash trees can be reported
- Symptom check list, location
- Additional images can be uploaded
- Well evidenced sites will be checked out
- Much more information available on FC website
- <http://www.forestry.gov.uk/chalara>
- Plan to use more widely for other tree pests and diseases

- Based on these experiences much more pro-active review of known threats, both in an out of EU
- Outcome of EU Plant Health Regulations?
- Reviewing and adding to range of PRAs and contingency plans
- More consideration of protected zone status for the UK or parts of the UK
- Highlighted need to consider 'journey' of plants from seed to planting
- Through Chalara Task Force, review of current UK plant health approach with recommendations for wide ranging changes
  - Risk register?
  - More parallels with animal health?
  - Investment in training?

## □ **Forest Research, Centre for Ecology, Society & Biosecurity**

- Gavin Hunter and Steven Hendry (Chalara ash dieback): Alice Holt and NRS
- Clive Brasier, Anna Harris, Bruno Scanu and Suzy Frey (*Phytophthora ramorum*): Alice Holt
- Nigel Straw, Dave Williams (ALB): Alice Holt
- Pest & Disease Diagnostic Advisory Service
  - Christine Tilbury, David Rose, Steven Hendry
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