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Assessment of the potential of the psyllid *Trioza anthrisci* to vector '*Candidatus* Liberibacter solanacearum' (Lso) in Scotland

- **FIONA HIGHET**
- Jason Sumner-Kalkun, Mairi Carnegie, David Kenyon, Yvonne Arnsdorf (SASA); Siobhán Madden (University of Glasgow), Alison Karley, Carolyn Mitchell, Jenni Stockan, Joan Beaton (Hutton), Chris Quine, Alistair MacLeod (Forest Research), David Ouvrard (Natural History Museum, London).

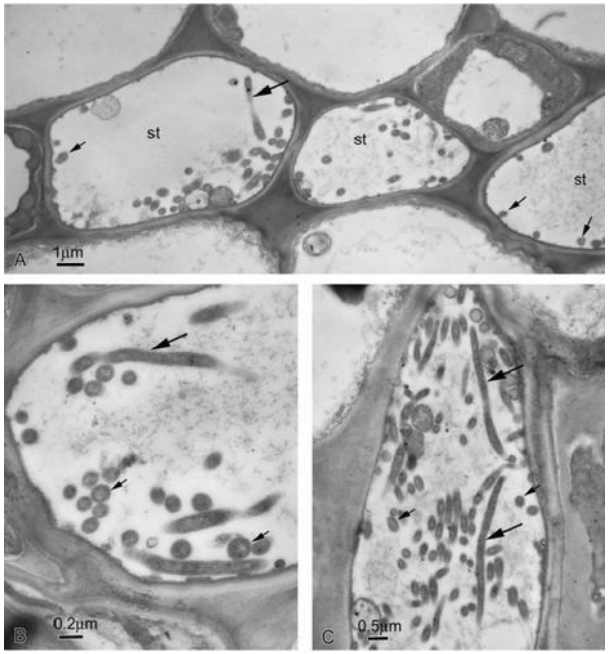
SASA Helping Scotland Grow

The James Hutton Institute

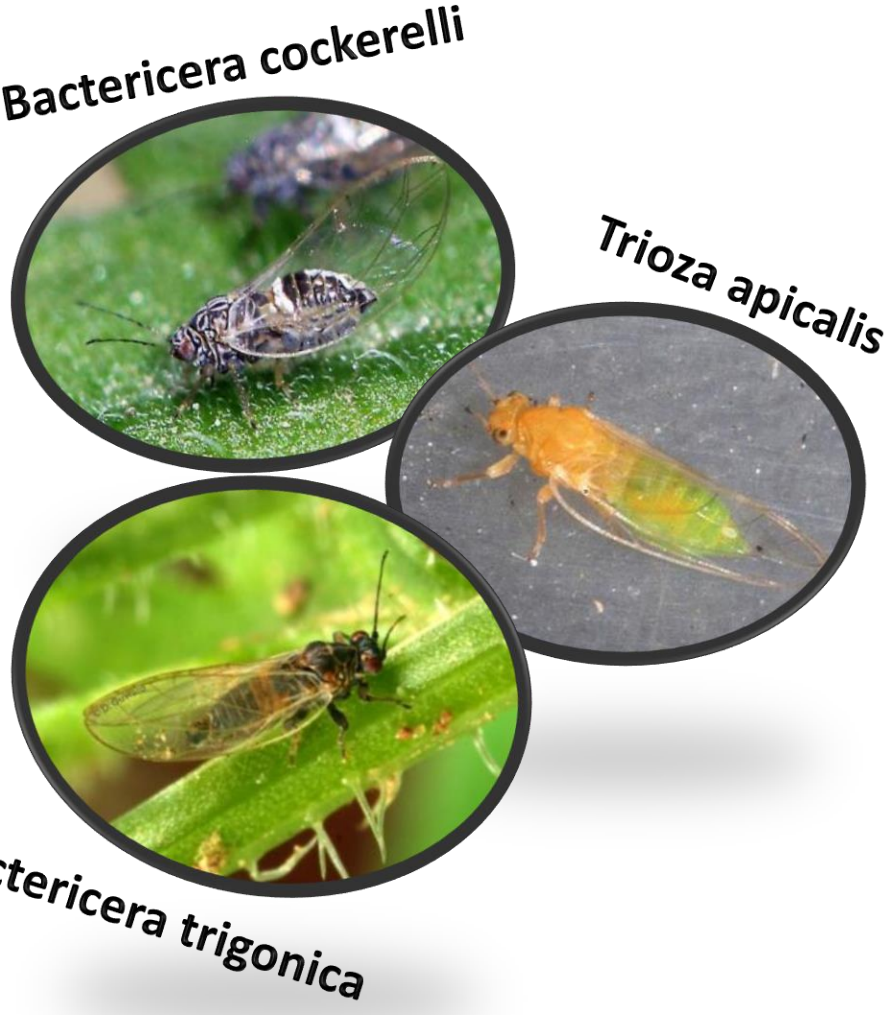
Forest Research

Natural History Museum

‘*Candidatus* Liberibacter solanacearum’ (Lso)



MULTIPLE HAPLOTYPES



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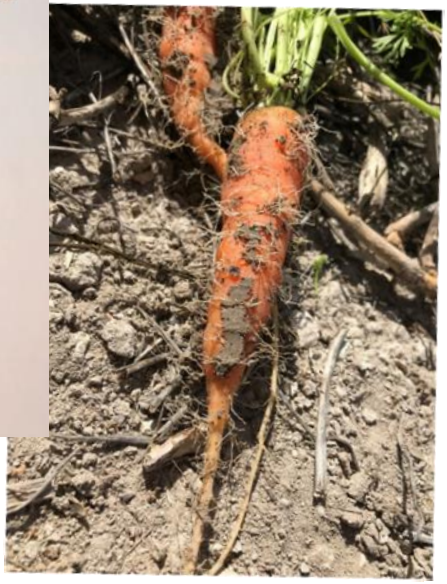
ZEBRA CHIP

SYMPTOMS IN POTATO

SYMPTOMS IN CARROT

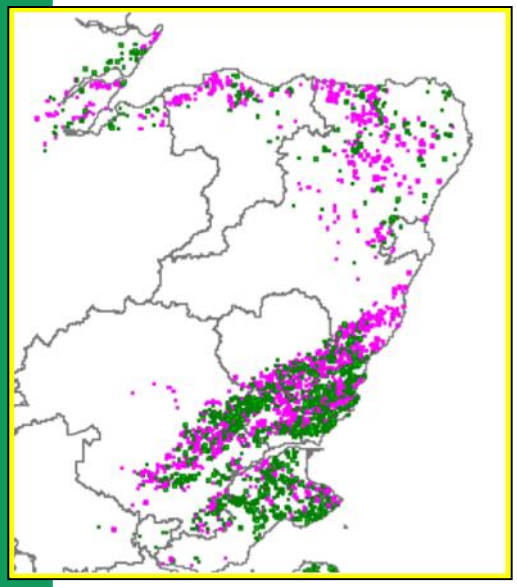


A CONCERN FOR SCOTLAND?

United Kingdom

Bacterium is **not** found in growing crops

Known vector, *T. apicalis, is* present in low numbers



Scottish Seed Potato Industry

Global reputation - High Health Quality

EU: 300,000t Non-EU: 90,000t

Scottish potato sector - £287 million

Potato grown in the same region as carrot

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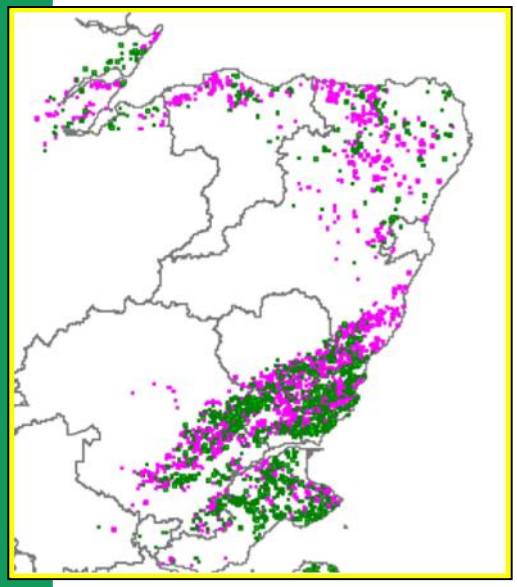
A CONCERN FOR SCOTLAND?

CURRENT RISK

United Kingdom

Bacterium is **not** found in growing plants

Known vector, *T. apicalis, is* present in low numbers



IMPACT

Scottish Seed Potato Industry

Global reputation - High Health Quality

EU: 300,000t Non-EU: 90,000t

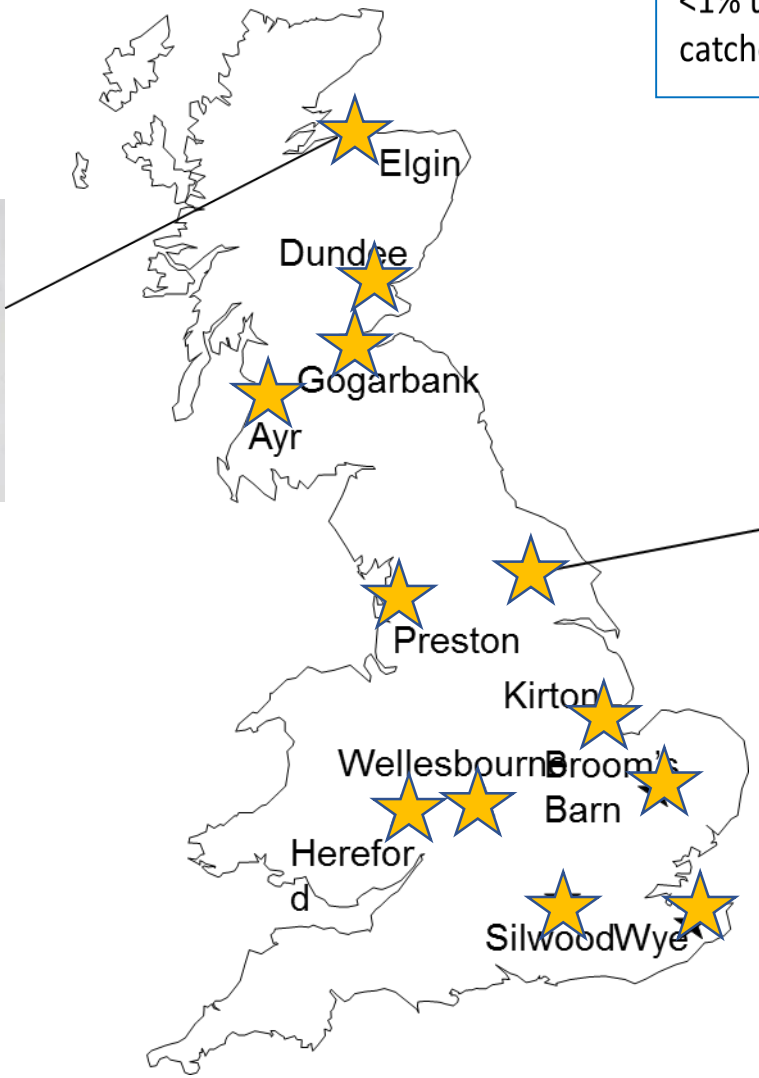
Scottish potato sector - £287 million

Potato grown in the same region as carrot

MANY UNKNOWNS

UK SUCTION NETWORK

<1% total suction trap catches 2015-2016



Previous/current projects - RESAS CRF, Euphresco, H2020

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NEW POTENTIAL VECTORS AND LOCATIONS DETECTED

Psyllid Species	Location	Haplotype
Trioza anthrisci	**Elgin, UK**	**C**
Trioza anthrisci	Hellfreda, Sweden	C
Trioza urticae	Quedlinburg, Germany	U

New Disease Reports (2017) **36**, 4. [http://dx.doi.org/10.5197/j.2044-0588.2017.036.004]

Get pdf (533 KB)

< Prev

First report of '*Candidatus* Liberibacter solanacearum' in the United Kingdom in the psyllid *Trioza anthrisci*

M.J. Sjölund [1*], M. Clark [1], M. Carnegie [1], A.F.C. Greenslade [2], D. Ouvrard [3], F. Highet [1], R. Sigvald [4], J.R. Bell [2], Y.M. Arnsdorf [1], R. Cairns [1] and D.M. Kenyon [1]

Journal of Plant Diseases and Protection
pp 1–4 | Cite as

'Candidatus Liberibacter solanacearum' detected in *Trioza urticae* using suction trap-based monitoring of psyllids in Germany

Authors | Authors and affiliations

M. Jennifer Sjolund, Yvonne M. Arnsdorf, Mairi Carnegie, Eva Fornefeld, Torsten Will

AIMS OF THIS PROJECT

- **To examine the distribution of *Trioza anthrisci* across Scotland in relation to carrot and potato growing areas**
- **To upskill relevant PHC staff by delivering a psyllid identification workshop**
- **To secure a live colony of *Trioza anthrisci* for Lso transmission studies and host plant choice bioassays**

- ‘Co-ordinate activities, skills and knowledge across Scotland’
- ‘Enhancing Scotland’s capacity and capability to respond to threats’

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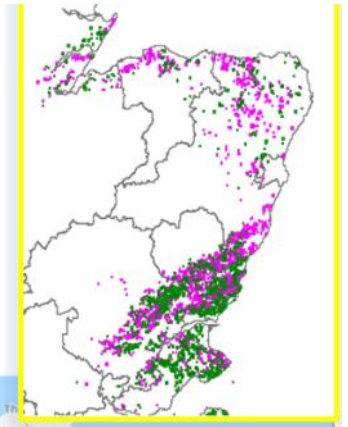
STEP 1 – CO-ORDINATED SAMPLING EFFORT



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STEP 2 – PSYLLID WORKSHOP

STEP 3 – REARING COLONIES OF SCOTTISH TRIOZA ANTHRISCI

- All ***T. anthrisci*** collected on **carrot** in **Elgin** (n= 16) tested positive for Lso (Hap C) in real-time PCR assays

Adult *Trioza anthrisci* ♀ from SASA insectary colony with egg attached to leaf surface inlaid (top left).

Symptomatic leaves in Anthriscus sylvestris infested with T. anthrisci

OUTCOMES

- 13 sites sampled – crops and vegetation
- Field finding of *Trioza anthrisci* in Scotland by FR – carrot crop near Elgin on 1 August
- Successful training workshop and networking opportunity
- Lab culture of *T. anthrisci* for further work

POOLED RESOURCES

INCREASED KNOWLEDGE

IMPROVED CAPABILITY

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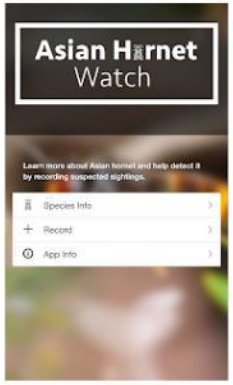
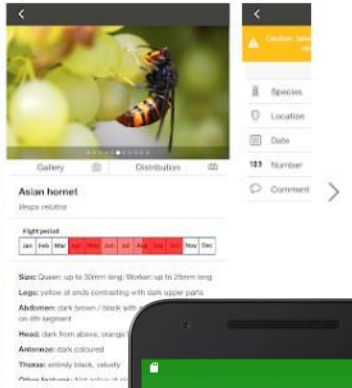
The use of mobile technology to enhance plant health monitoring and awareness

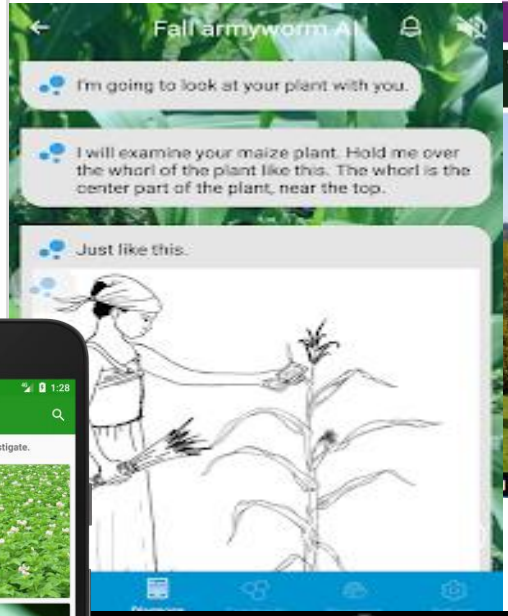
Sebastian Raubach & Jennie Brierley
The James Hutton Institute

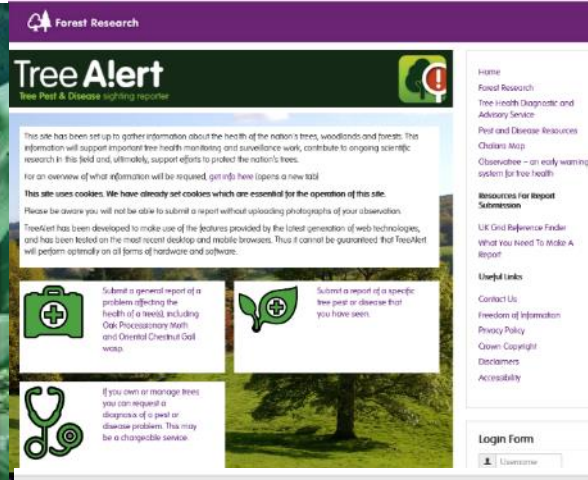
The James Hutton Institute


Asian Hornet Watch
Learn more about Asian hornet and help detect it by recording suspected sightings.
Species Info
Record
App Info


Species
Asian hornet is often confused with similar species, find out more about each below.
Asian hornet
European hornet
Giant Woodwasp / Greater Horntail


Gallery
Distribution
Asian hornet
Vespa velutina
Species
Location
Date
Number
Comment


Fall armyworm AI
I'm going to look at your plant with you.
I will examine your maize plant. Hold me over the whorl of the plant like this. The whorl is the center part of the plant, near the top.
Just like this.


Forest Research
Tree Alert
Tree Pest & Disease sighting reporter
Home
Forest Research
Tree Health Diagnostic and Advisory Service
Pest and Disease Resources
Chalara Map
Observatree – an early warning system for tree health
Resources For Report Submission
UK Grid Reference Finder
What You Need To Make A Report
Useful Links
Contact Us
Freedom of Information
Privacy Policy
Crown Copyright
Disclaimers
Accessibility
Login Form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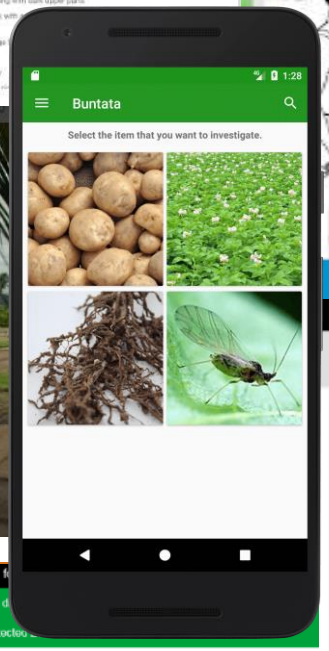
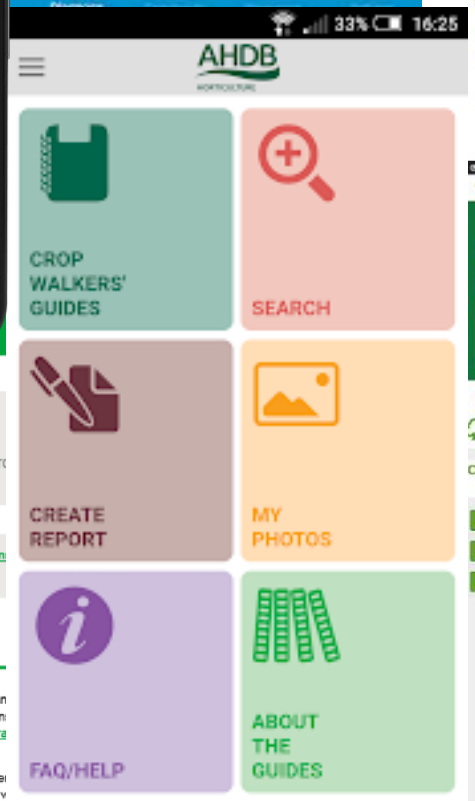
grow smart.

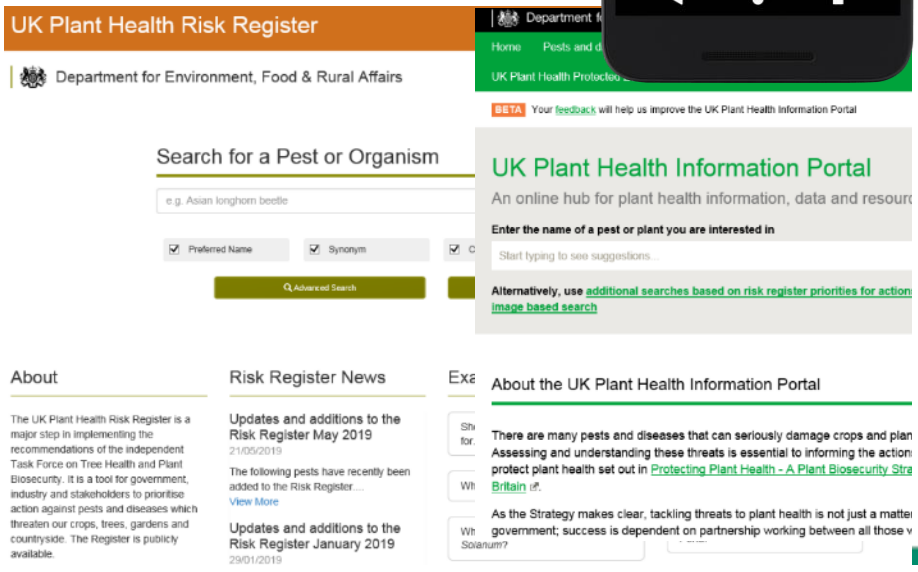

Buntata
Select the item that you want to investigate.


Plantwise Factsheets
CABI
Books & Reference
PEGI 3


AHDB
CROP WALKERS' GUIDES
SEARCH
CREATE REPORT
MY PHOTOS
FAQ/HELP
ABOUT THE GUIDES

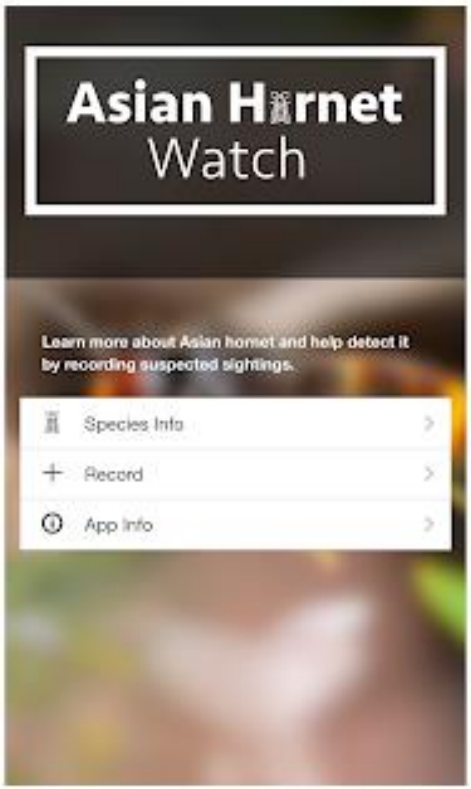

Plantwise
Browse by crop
Browse by problem
You can use our search tool to find out what problems might be affecting your crop, and to find information on management of pests and diseases.
Add a new country pack
Forestry Commission
Banana
Fusarium wilt of banana
Fusarium oxysporum f.sp. cubense
KENYA
The disease is found in the soil where it can survive for many years. It can be spread by diseased soil, suckers and infected materials like boots and hoes from other farms.
Coffee
Coffee wilt disease


Chalara (Hymenoscyphus fraxineus) - infections confirmed in the Wider Environment
1st May 2019
Chalara Explained
Map Legend
Website Information
Glasgow
Edinburgh
Newcastle-upon-Tyne
Manchester
Birmingham


UK Plant Health Risk Register
Department for Environment, Food & Rural Affairs
Search for a Pest or Organism
e.g. Asian longhorn beetle
Preferred Name
Synonym
Advanced Search
About
The UK Plant Health Risk Register is a major step in implementing the recommendations of the independent Task Force on Tree Health and Plant Biosecurity. It is a tool for government, industry and stakeholders to prioritise action against pests and diseases which threaten our crops, trees, gardens and countryside. The Register is publicly available.
Risk Register News
Updates and additions to the Risk Register May 2019
21/05/2019
The following pests have recently been added to the Risk Register...
View More
Updates and additions to the Risk Register January 2019
29/01/2019

Home
Pests and d
UK Plant Health Protected
BETA
Your feedback will help us improve the UK Plant Health Information Portal
UK Plant Health Information Portal
An online hub for plant health information, data and resour
Enter the name of a pest or plant you are interested in
Start typing to see suggestions...
Alternatively, use additional searches based on risk register priorities for action
image based search
About the UK Plant Health Information Portal
There are many pests and diseases that can seriously damage crops and plan
Assessing and understanding these threats is essential to informing the action
protect plant health set out in Protecting Plant Health - A Plant Biosecurity Stra
Britain
As the Strategy makes clear, tackling threats to plant health is not just a matte
government; success is dependent on partnership working between all those v

Pest and disease alerts
Pest and disease identification guides
Report/notification links
Pest and pathogen distribution maps
Control options



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- The diversity of the plant health sector is reflected in the range of mobile tools available.
- There are existing tools in use in the UK which could be adapted for other sectors / specific threats.
- Underpinning resources to secure the usability, sustainability and value of the system are essential.

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Sharing solutions between sectors: methods deployed for tackling pests and disease

Eric Boa and Steve Woodward
University of Aberdeen

1 4 9 5
UNIVERSITY OF ABERDEEN

Understanding change

- How have ‘distinctive and different’ pest management methods arisen?
- Define user groups and create a typology of methods and approaches
- Survey methods adopted by different groups and compare approaches
- Consider possible drivers of change – from growers, agrochemicals companies, new technologies
- Review our understanding of the dynamics of change

Barley leaf rust

What we did

- Created six General Types of users of pest management methods and six Main Categories of methods
- Held a public event at RBGE (Vox Pop Plants) and tested a questionnaire for assessing methods used

Wheat rust

Further details can be found on the poster

Full details of categories available in final report

Main Findings, next steps

- Categories of users and methods:
  - a consistent approach for analysing patterns and dynamics of pest management methods deployed
- General Types and Main Categories:
  - require validation by others
- Questionnaire approach to surveying methods deployed has limited value

Main Findings, next steps

- Target key users of pest management methods:
  - commercial
  - advisors, consultants
- Make a clear distinction between:
  - general *information* about pest management methods
  - general *recommendations* and
  - specific *advice*

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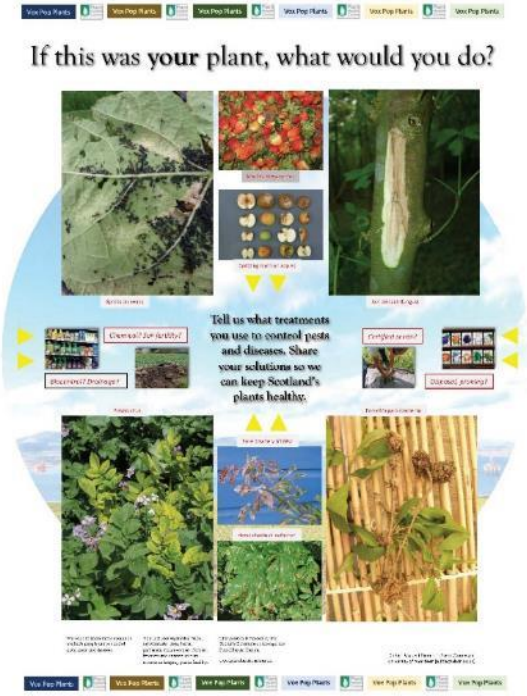
Thanks to Katy Hayden, RBGE and Rob Harling



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Network analysis – where do people get their plant health information?

Rehema White, Althea Davies & Robbie Fitzpatrick

University of St Andrews
Scotland's first university – 1413

James Robinson and Mariella Marzano

Forest Research

Elliot Meador and Henry Creissen

SRUC

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Context for plant health

- Climate change
- Globalisation
- Trade
- Gardening and recreation intensity
- Focus on plant health science

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Methods

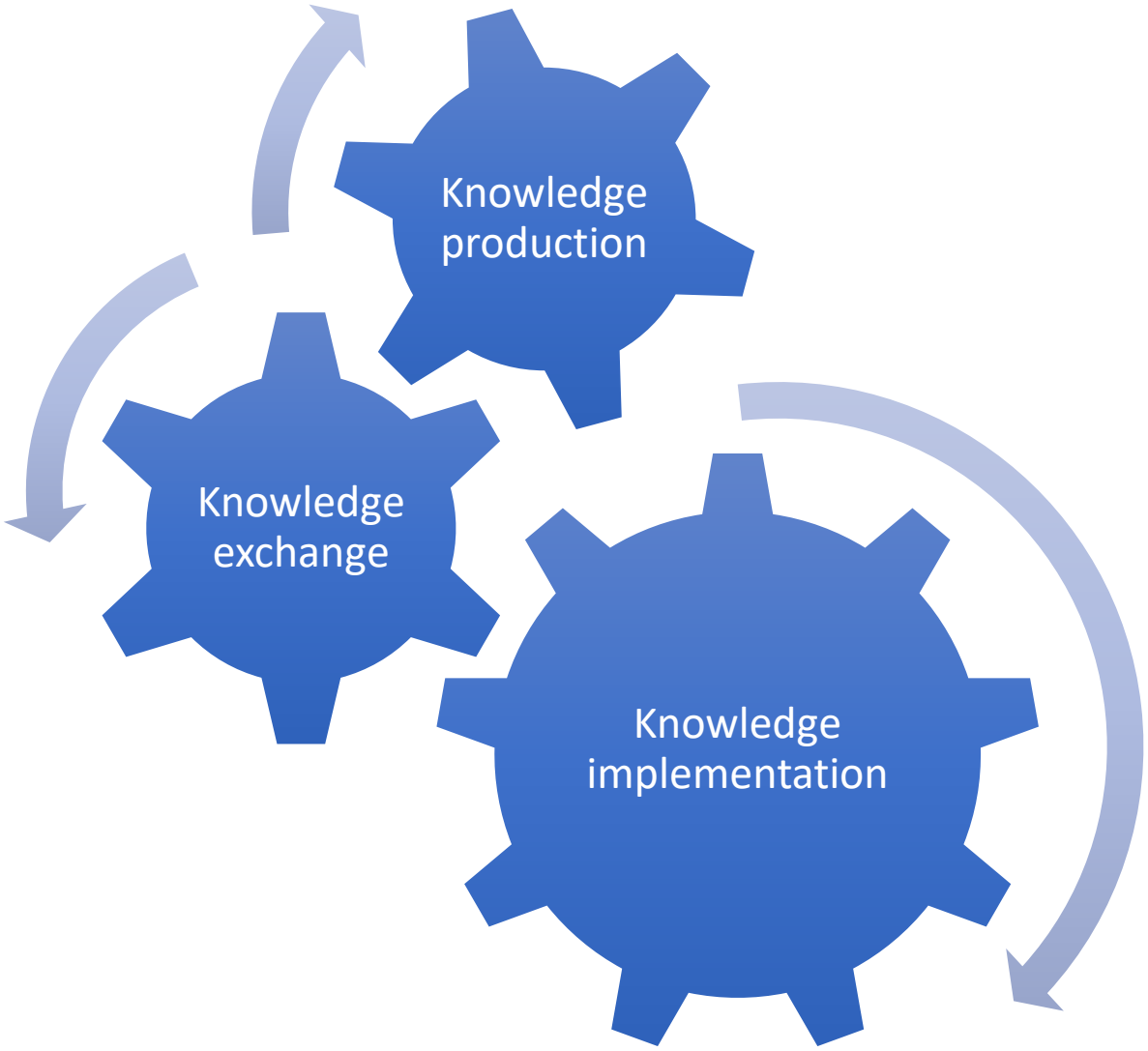
- Literature review & annotated bibliography
- Stakeholder mapping of **Vectors**, **Governors, Managers, Monitors** or **Networkers (Dandy et al 2017) plus Plant enthusiasts**
- Interviews with 6 key informants
- Survey of 24 people involved with potato farming
- Emerging views on knowledge sources from horticultural trade
- Collaboration with SRUC on twitterspphere




- ***Information*** is objective 'facts', but if it is to effect change, it must be interpreted, absorbed and is subject to social relationships – hence we consider ***knowledge***.

- Action on knowledge requires changes in behaviour or societal structure: we have a **knowledge gap**.

https://6-heads.com/2015/06/02/join-us-for-steps-to-sustainability-20th-june-poetry-of-change/


Knowledge production
Knowledge exchange
Knowledge implementation

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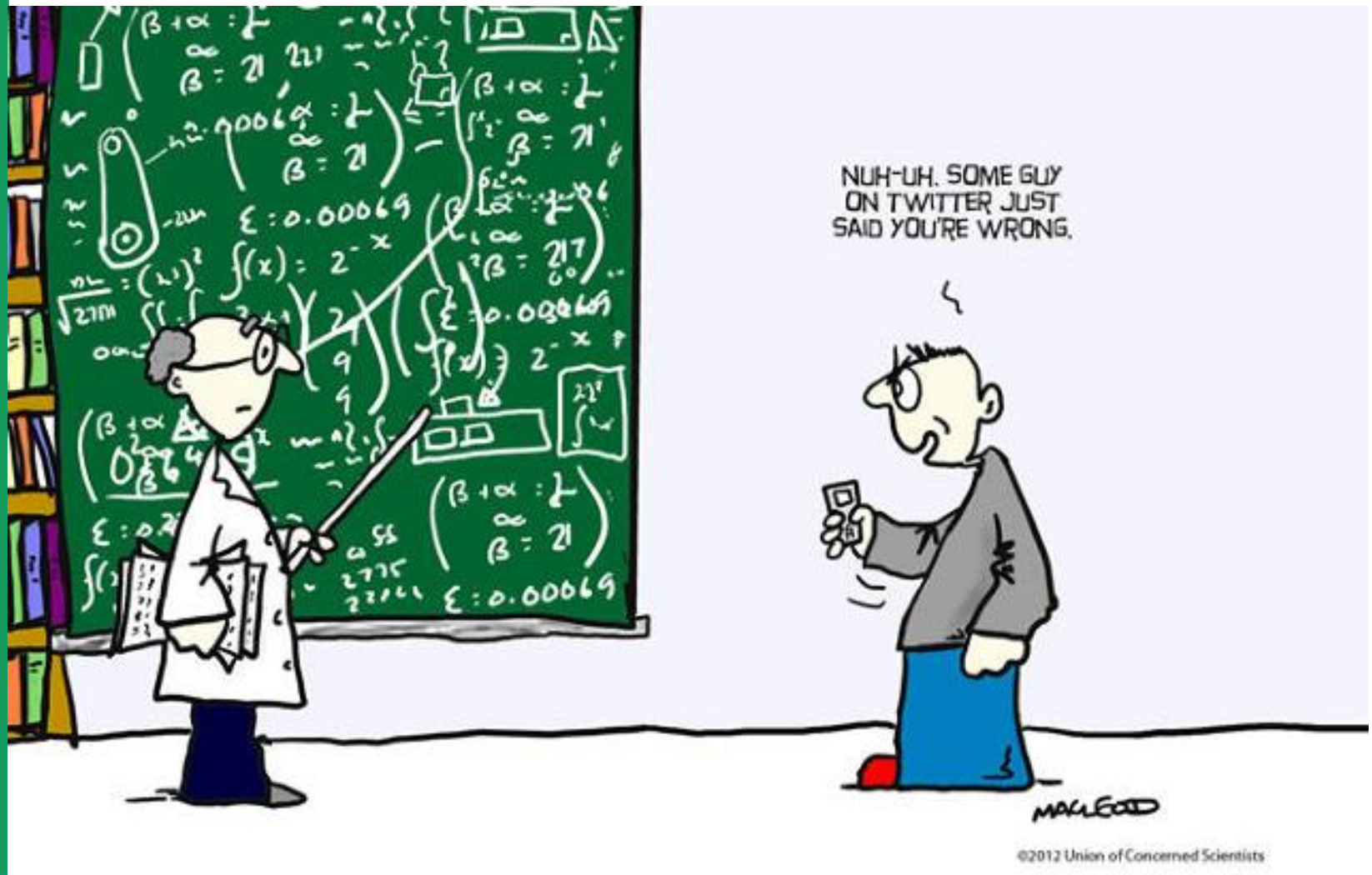
The contested nature of knowledge and new roles for science



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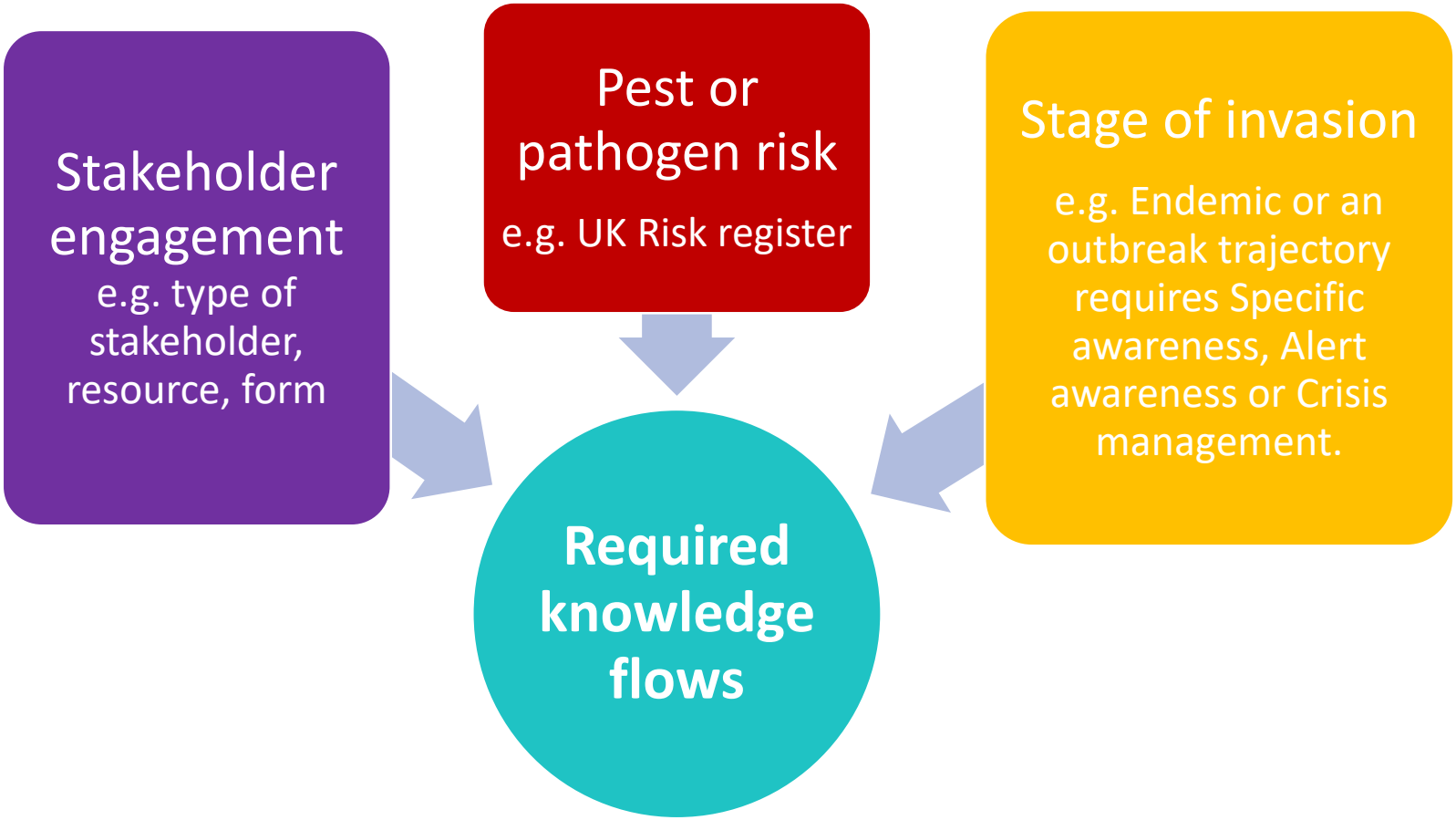
What knowledge flow is required?



Results: interviews

- In Agriculture (and hort) prediction and prevention of pests are common, and chemicals widely used, more than in Tree Health (including forestry/ natural environment).
- There are key figures eg agronomists
- Organisations are key for training and knowledge exchange
- Social media was important for some organisations, but was less used /trusted by individuals; face to face preferred

"my gosh all these sources of information."

"We've got nuanced arguments to get across"

"Relatively low-level biosecurity becomes a cultural change"

"we've still got a way to go to …a genuine two-way process"

"..it's a very small percentage of arable farmers that really know the pests and diseases … [most] are not really that interested. They want someone to come along, look at the crop, write them a script or tell them the chemical straight away …"

"the older ones want to see you and speak to you over a cup of tea in the kitchen, the younger ones ae quite happy with a WhatsApp"

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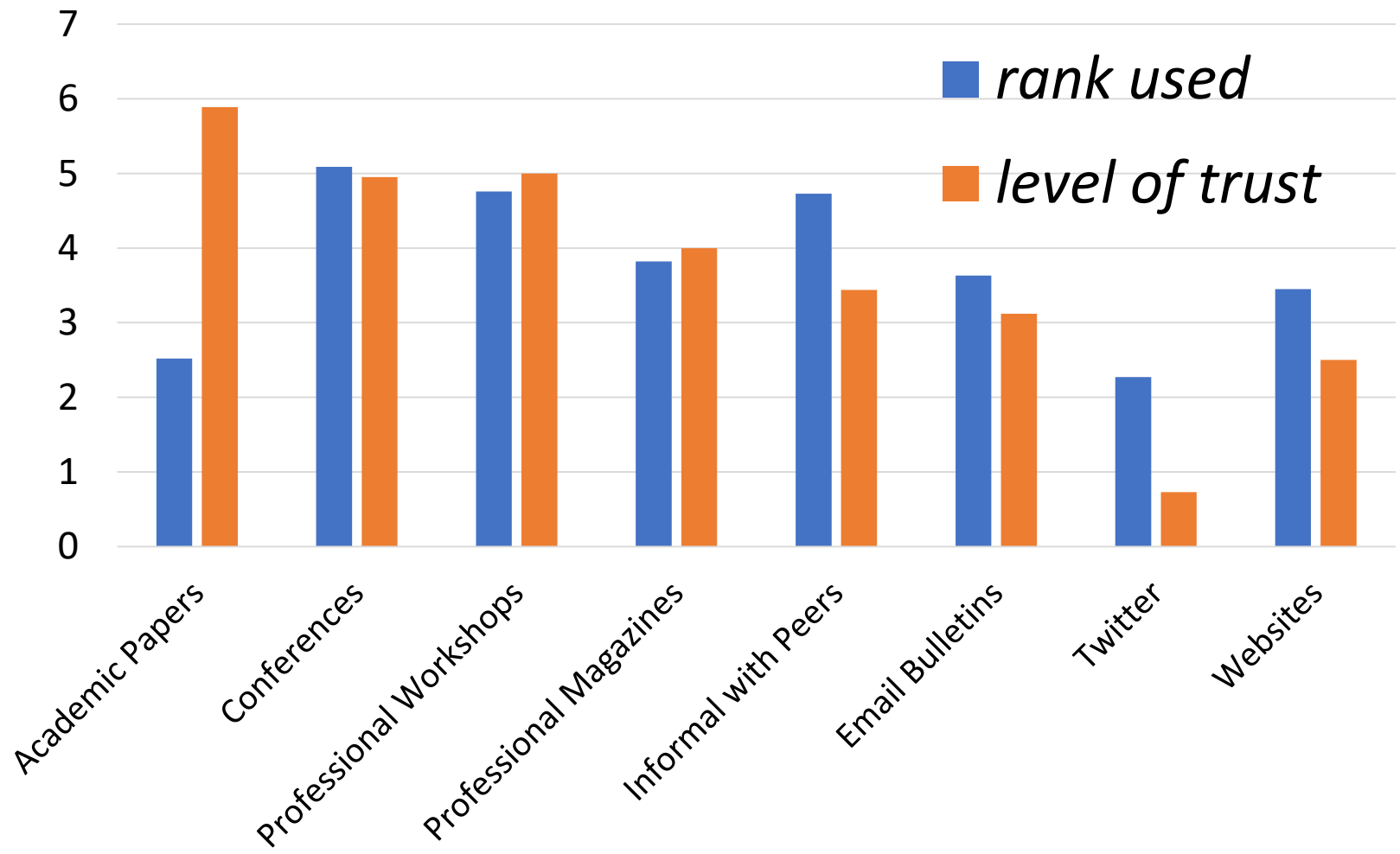
Results: survey of 24 potato people



Results: horticultural sector

In the horticultural sector, government departments and key institutions were important sources of knowledge. Academic research was rarely directly accessed.

"really aware of plant health as a business liability"

Key conclusions & recommendations

Knowledge production, exchange and implementation is complex across many stakeholders. We recommend:

- Develop a **stakeholder engagement strategy** including different knowledge exchange approaches for stakeholder types and contexts, sectors, pests and stages of outbreak and that includes (and maintains existing) collaborations and partnerships as well as creating specific knowledge channels.
- **Further research is required on knowledge flows in relation to plant health specifically**, in Scotland, and in relation to other sectors.
- **Translating and distributing academic knowledge** for practitioners who trust but do not access this knowledge source is needed.

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Plant Health in the Twittersphere: Identifying new approaches to rapid dissemination of plant health information in Scotland

Led by Dr Elliot Meador (SRUC) &
Dr Henry Creissen (SRUC)

Special thanks to Andrew Duncan and Aaron Reeves at the SRUC Epidemiology Research
Unit for allowing us to use the RStudio Server for this research.

Overview

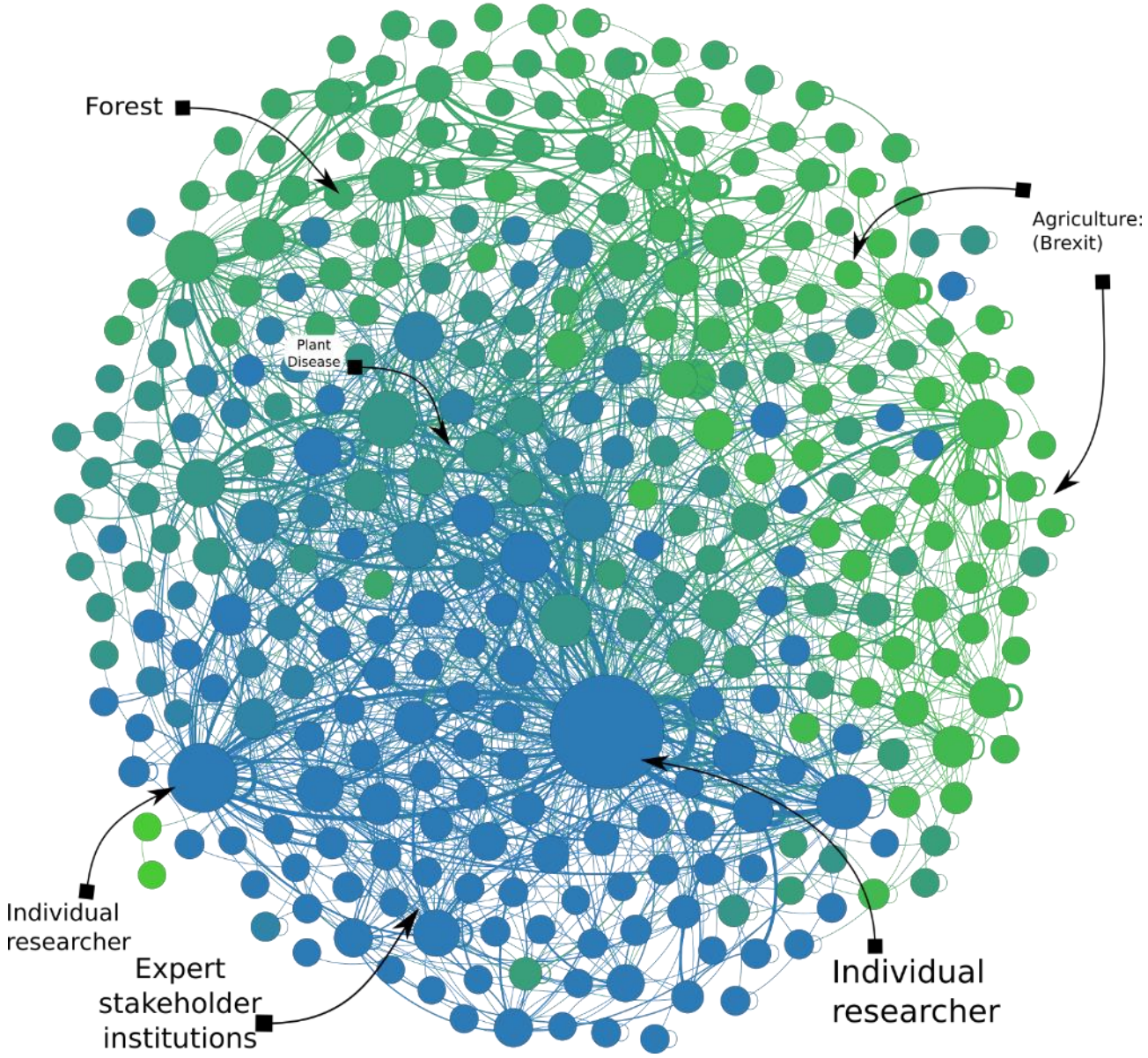
Project looks at how information on plant health issues is discussed online using Twitter.

Approach

1. Data obtained using *network jumping* approach.
2. Gathered nightly.
3. Data analysed using text mining and social network analysis.

The tip of the Twittersphere

Top 2.18% of users discussion issues related to plant health



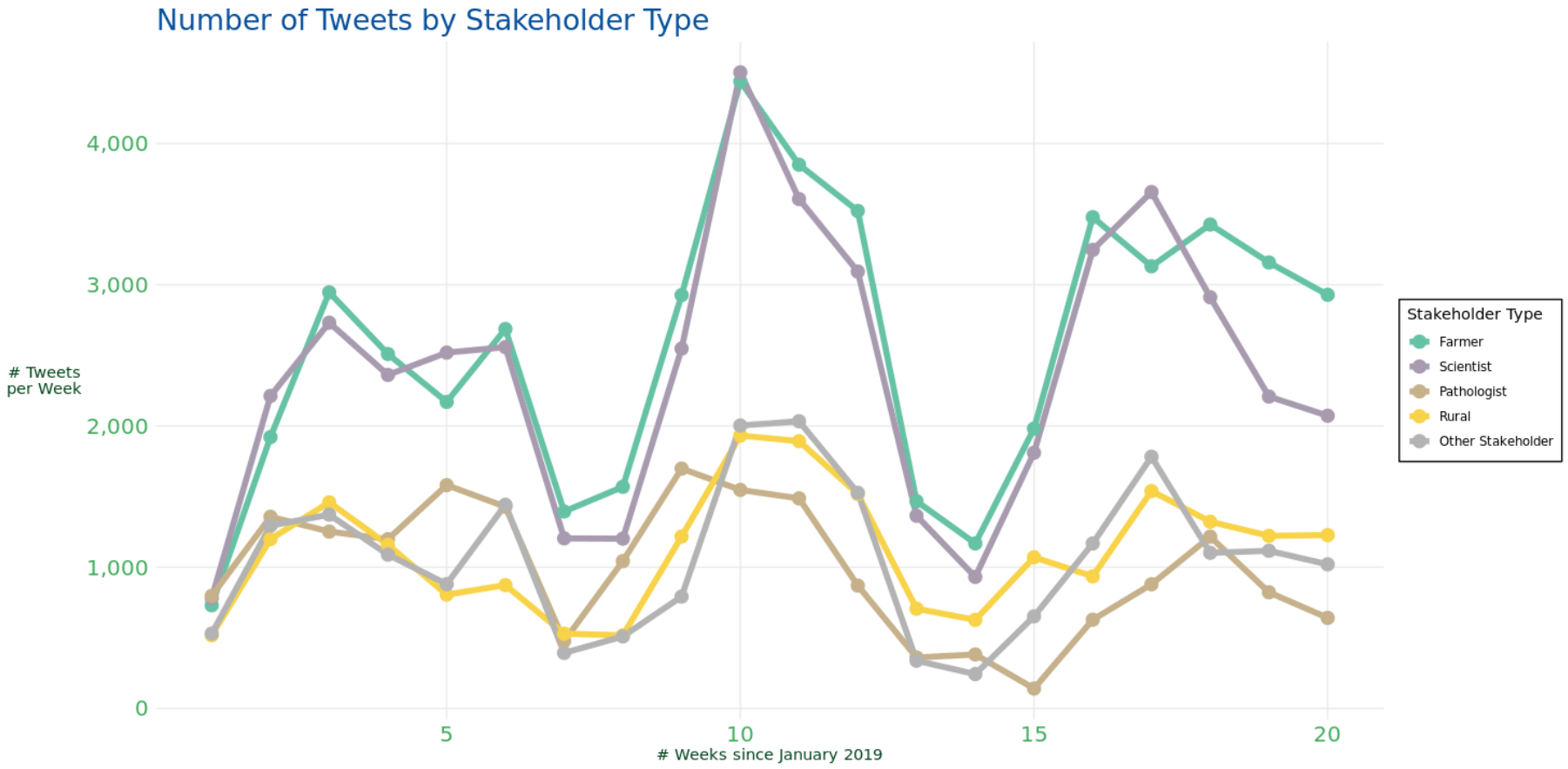
Classifying users

Number of UK Users by Country

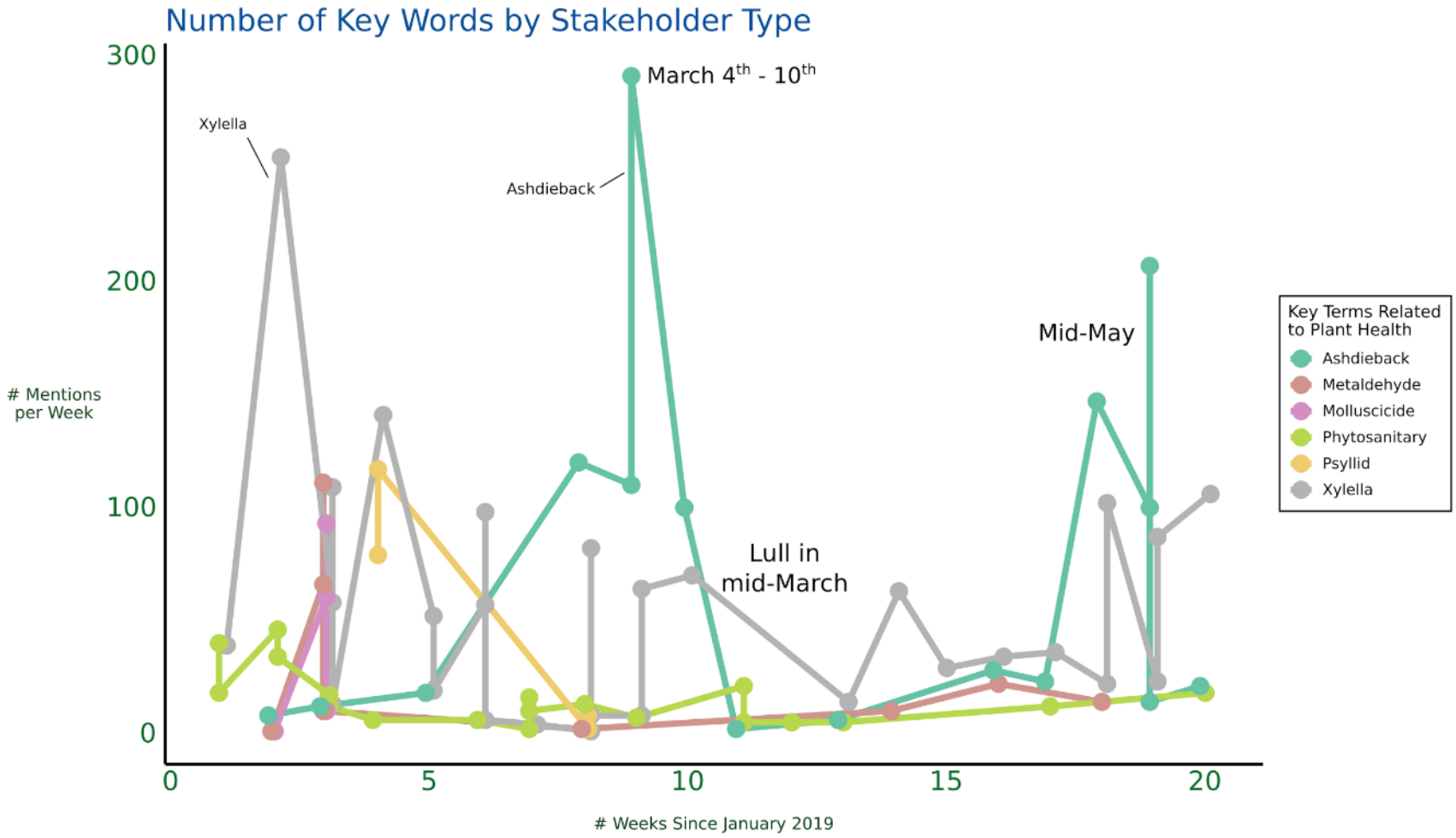
Category	England (n =381)	North Ireland (n =5)	Scotland (n =2,723)	Wales (n =18)
Farmer	22.3%	100%	57.3%	44.4%
Scientist	59.8%	0.0%	27.5%	33.3%
Pathologist	7.9%	0.0%	4.7%	0.0%
Rural	10.0%	0.0%	10.5%	22.2%

[a] Approximately 2.97% of stakeholders reported their country.

Trends over time



Current issues



Future studies

1. Research is ongoing (with data being collected nightly).
2. Will revisit this Autumn for changes over the summer and Brexit.
3. Future work will centre on further classification of users in the database.

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New online resource: Plant Diseases in the Natural Environment

Katy Hayden, Joanne Taylor (RBGE)

Royal Botanic Garden Edinburgh

Plant Health Centre
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www.planthealthcentre.scot/plant-diseases

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Plant Diseases in the Natural Environment

Threats

Disease causing organisms include fungi, bacteria and viruses, and also insect pests and nematodes. View a list of high priority threats to Scottish native plants alphabetically, or sort by plant or habitat type.

View Threats

Prevention & Control

The best approach to disease management is to avoid the introduction of a disease, to contain any outbreaks and to prevent movement of disease-causing organisms. Implementing careful biosecurity measures can reduce the risk of the introduction and spread of diseases. However, where there is evidence of disease this requires action to diagnose the causal organism, to implement control measures where possible and to report notifiable diseases when encountered.

View Prevention & Control

Recommended Sources

View a curated list of plant health institutions, newsletters and other resources.

- Biosecurity
- Diagnostic Services
- Field Guides & Self-Diagnostics
- Treatment & Management
- Newsletters
- Further Information
- Reporting & Regulatory Information
- Outreach & Education

View All Sources

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Threats

Habitat Type | Betula (Birch) | Keyword

Apply | Clear Filters

Disease Agent	Habitat Type	Host	Information	Control
Alder Rust (Melampsoridium hiratsukanum) 	Broadleaved, mixed and yew woodland	Alnus (Alder) Betula (Birch)	NOBANIS – Invasive Alien Species Fact Sheet	Problems of Leaves, Twigs and Branches
Asian Longhorn Beetle (Anoplophora glabripennis) 	Bogs Boundary and linear features Bracken Broadleaved, mixed	Acer (Maple, Sycamore) Betula (Birch) Populus (Poplar, Aspen)	**NOTIFIABLE ORGANISM** Forest Research fact page Opal fact page	Notifiable Diseases

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Prevention & Control

Prevention – Biosecurity

An ounce of prevention is worth a pound of cure. Good biosecurity practice prevents the arrival and spread of disease-causing organisms, and is essential for safeguarding the health of plants in propagation and natural systems.

Read More

Control

What to do when disease strikes? We outline advice suitable for the natural environment for treatment and control of different categories of plant diseases.

Read More

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Recommended sources

Field Guides & Self Diagnos

Keyword

Apply | Clear Filters

Resource	Details
CABI	CABI provies comprehensive cross sector information including plant health via the Plantwise portal
CABI online book	Fieldguide for the identification of Damage on Woody Sentinel plants. This guide is recommended as the first step in disease identification of trees and shrubs
DEFRA - pest and disease factsheets	Fact sheets on notifiable and non-notifiable pests and diseases

Acknowledgements

- Funding by the Scottish Government's Rural and Environment Science and Analytical Services (RESAS) Division through the Centre of Expertise for Plant Health
- Andrew Thorburn, James Hutton Institute
- John Hume, Allstar Solutions

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Integration of Plant Health planning into the new Scottish Biodiversity Strategy

Katy Hayden (RBGE), Fiona Highet (SASA),
Ruth Mitchell (James Hutton Institute),
Alexandra Schlenzig (SASA)

Royal Botanic Garden Edinburgh

SASA
Helping Scotland Grow

The James Hutton Institute

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Known threats to Scottish biodiversity: The Plant Health Risk Register

Photos: Joanne Taylor; Katy Hayden, David Crossley, Fera, Crown Copyright; Susan Ellis, Bugwood.org; Art Wagner, USDA-APHIS, Bugwood.org

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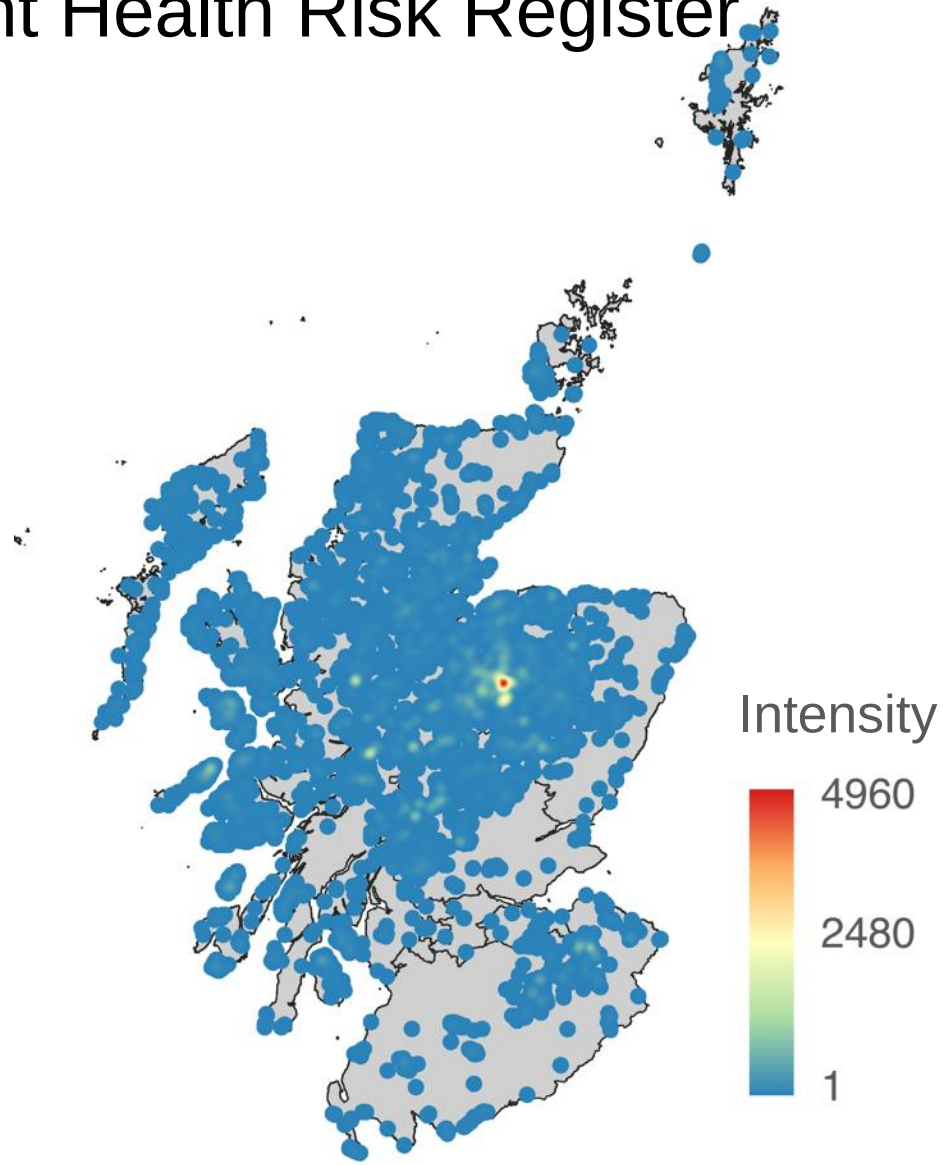
Known threats to Scottish biodiversity: The Plant Health Risk Register

Potential distribution of PRR pests on BAP (2007) priority species hosts



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Yet-unknown threats to Scottish biodiversity: risk ranking

Photos: RBGE; Aberdeen Journals Ltd; Forestry and Land, Scotland

Acknowledgements

- Funding by the Scottish Government's Rural and Environment Science and Analytical Services (RESAS) Division through the Centre of Expertise for Plant Health
- Jim McIntosh, Botanical Society of Britain and Northern Ireland, for plant distribution data
- The Department for Environment, Food, and Rural Affairs for the Plant Health Risk Register

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Impact of climate change on the spread of pests and diseases in Scotland

Project lead: Adam Kleczkowski (University of Strathclyde)

Project partners: Prof. Crawford Revie and Dr Oleg Sheremet (University of Strathclyde); Dr Glyn Jones (FERA and University of Newcastle); Dr Matt Castle (University of Cambridge).

University of Strathclyde Glasgow

fera

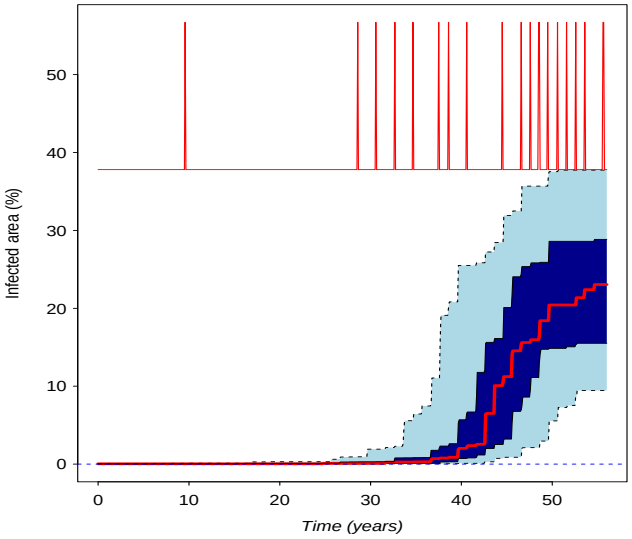
Newcastle University

University of Cambridge

Objectives

- Effects of climate change on spread of pests and pathogens
- Assess how the key parameters and values at risk are expected to vary with climate change
- Use a model to study epidemiological and economic outcomes for selected pests and pathogens

% area infested (median, 50% and 95% c.i.s)



Sample run for months with temperatures over 21.5°C

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Potential impacts arising from pesticide withdrawals to Scotland's plant health

Andy Evans, SRUC

Objectives

- Assesses the risk of withdrawal of the main pesticides used in Scotland across the agriculture, horticulture, natural environment, forestry and amenity sectors
- Provide an assessment of the impact of losses of key pesticides in each of the above sectors

Cereals & Oilseed rape

Loss of chlorothalonil, azoles, neonicotinoids – resistance to alternatives

Legumes & Potato

Loss of iprodione, thiram, chlorothalonil, linuron – peas & beans

Loss of mancozeb, fluazinam resistance, diquat, aphicides - potatoes

Soft Fruit

Loss of myclobutanil, azoles, bupirimate, iprodione – few alternatives available

Loss of chlorpyrifos, abamectin, spinosad, thiacloprid, deltamethrin – few alternatives

Soft fruit production could become uneconomic

Field Vegetables

Loss of azoles, thiram, cymoxanil and other fungicides – few alternatives

Loss of metribuzin, glyphosate, linuron, pendimethalin and clomazone – few alternatives

Loss of pymetrozine, thiacloprid, spinosad, pyrethroids – few alternatives

Some field vegetable production could become uneconomic

Forestry

Loss of glyphosate, pendimethalin and asulam – few alternatives available

Loss of urea – few alternatives available

Loss of alpha-cypermethrin and cypermethrin – few alternatives available

Amenity & Natural Environment

Loss of glyphosate, mancozeb, propiconazole – few alternatives available

Fewer pesticides to target invasive species

Key outputs and recommendations

- For all sectors, the loss of key substances will have a significant impact on the ability to manage pests, weeds and diseases effectively and economically
- In particular for the soft fruit and field vegetable sectors, production will be significantly affected, and may become uneconomic
- All sectors, where plant health management is required, will need to adapt to pesticide losses

Key outputs and recommendations

- Available pesticides will need to be conserved and their use targeted within an Integrated Pest Management (IPM) framework
- The cost of production is likely to increase as alternative approaches for managing crops are utilised
- Engagement with stakeholders in all of the sectors where plant health management is required should be a priority

Acknowledgements

- Gillian Reay and Jackie Hughes (SASA), Iain Willoughby (Forestry Commission), Spencer Collins and Jon Knight (AHDB), Michelle Fountain (NIAB EMR), James Porter (East Scryne Fruit and NFU Scotland), Miryana McKay and Philippa Dodds (Angus Growers), Ross Greenhill (Kettle Produce), Sir John Moverley (Amenity Forum), Mike Inglis (Albert Bartlett), Julian Bell (SAC Consulting), Fiona Burnett, Neil Havis and Martin Richards (SRUC)

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The future threat of Potato Cyst Nematodes (PCN) in Scotland

The James Hutton Institute

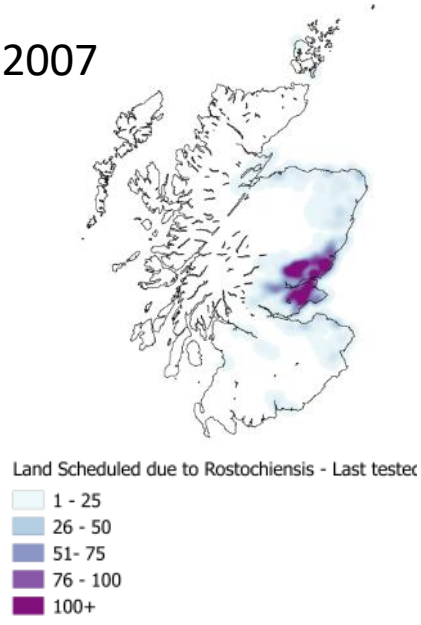
SASA Helping Scotland Grow

University of Strathclyde Glasgow

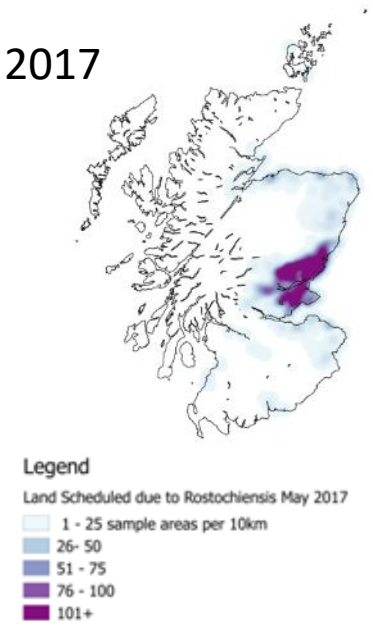
BioSS

PCN situation in seed land

2007

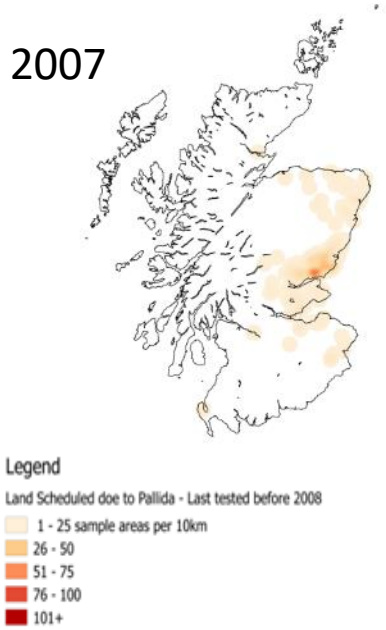


2017

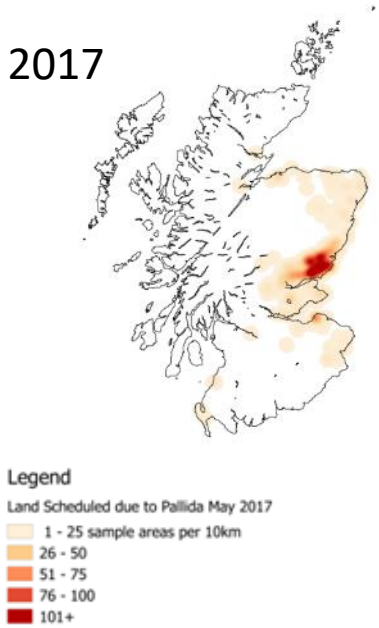


G. rostochiensis

2007



2017



G. pallida

***G. rostoch.* in 2010 (Ha)**	***G. rostoch.* in 2017 (Ha)**	***G. rostoch.* increase**	***G. pallida* in 2010 (Ha)**	***G. pallida* in 2017 (Ha)**	***G. pallida* increase**
13,453	14,217	6%	2,411	5,214	116%

What can be done?

- Seed free from cysts
- Resistant varieties
- Tolerant varieties
- Rotation
- Groundkeepers
- Nematicides
- Biofumigants
- Trap crops
- Biosecurity
- Knowledge

What we want to find out

- Where we have come from and where we are going?
- What are we going to do about it?
- Who is driving and do we have any control of the vehicle?

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Identifying modelling approaches of Emerald Ash Borer invasions for Scotland's needs

Project lead: Adam Kleczkowski (Uni. Of Strath.)

Project partners: Vincent Keenan (Uni. Of Strath.); Glenn Marion (BioSS)

University of Strathclyde Glasgow

BioSS

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Emerald Ash Borer

Emerald Ash Borer is native to East Asia and requires Ash trees to complete its lifecycle.

Currently absent from the UK.

Estimates $20 – 282 billion damage within the U.S.A.

Would be devastating to Scotland's Ash populations.

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Ash mortality from Emerald Ash Borer

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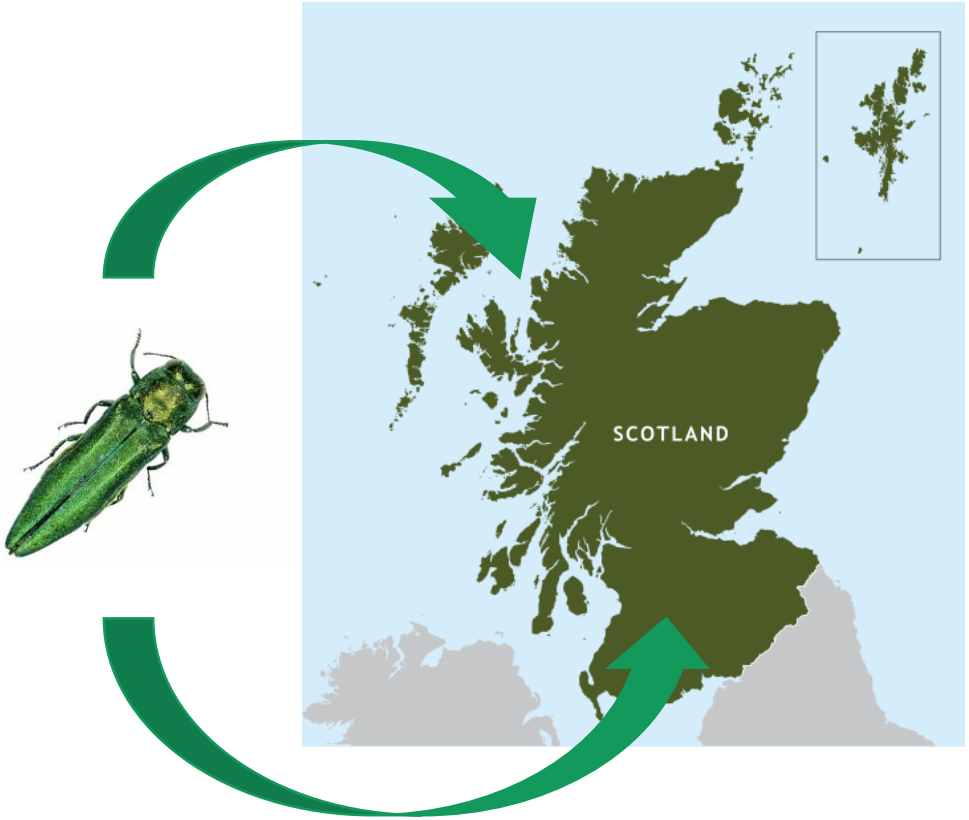
What do we do if Emerald Ash Borer arrives in Scotland?



?

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What do we do if Emerald Ash Borer arrives in Scotland?

Do nothing?

Use methods from elsewhere?

Run a contained experiment?

Develop predictive models?

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Mathematical modelling

Predictive modelling is a cost-effective method for tracking invasion progress.

We conducted a review of bark beetle modelling methods.

- Beetle spread
- Beetle life cycle
- Economic impacts of infestation
- Climatic impacts on infestations

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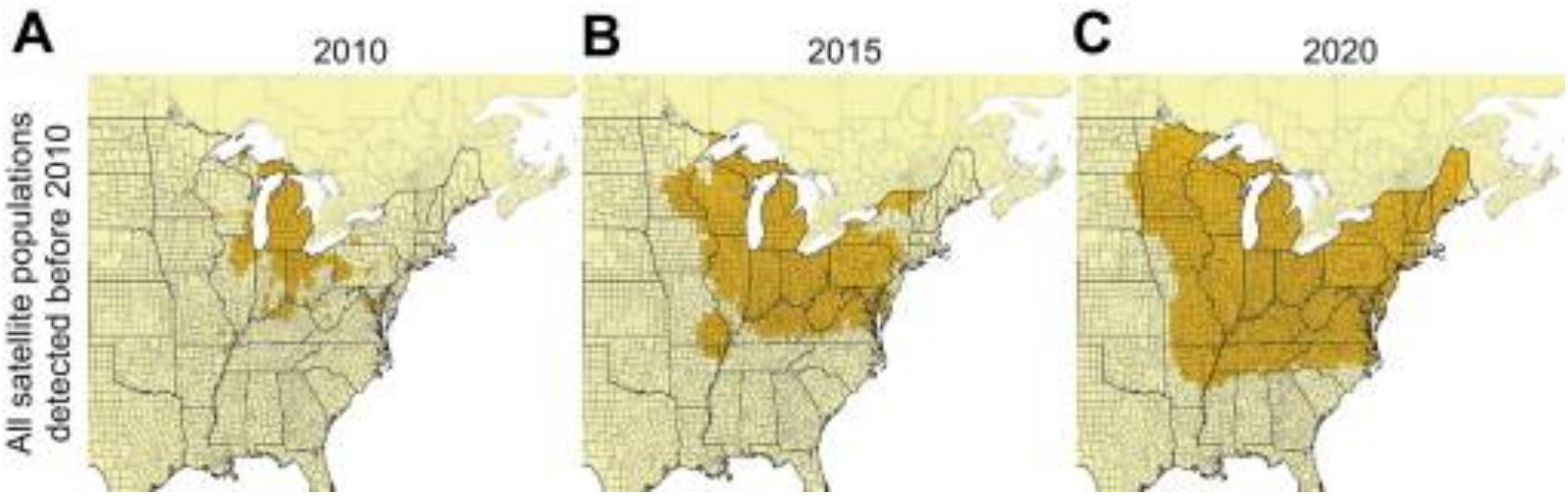
Spread of Emerald Ash Borer



Great Lakes infestation 2010 – 2020

Estimate a basic rate from detection data

Use data to estimate spread rate.

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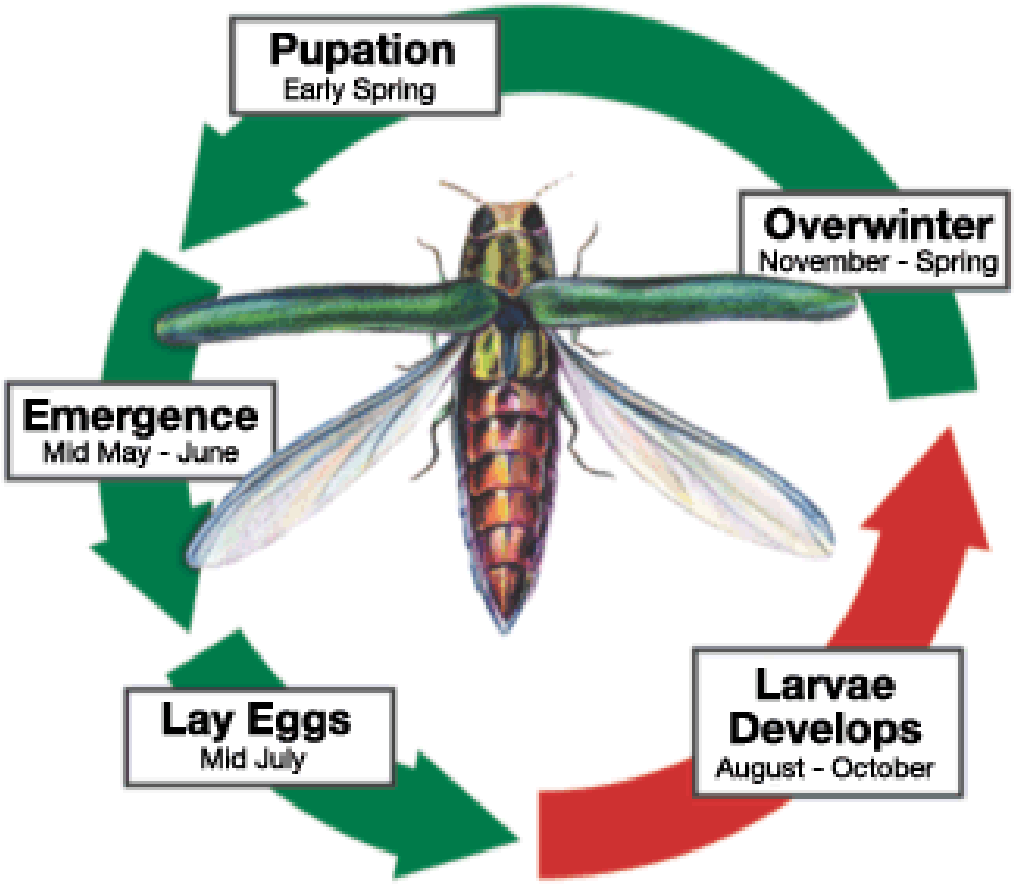
Growth of Emerald Ash Borer



Including life cycle data makes models more realistic

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Data sources available for models

Forestry and Land Scotland
Coilltearachd agus Fearann Alba

Forest Research

Met Office

Scottish Forestry
Coilltearachd na h-Alba

Forestry Commission

USDA
United States Department of Agriculture

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Model Transplant?

Not straight forward

Scottish environment and climate differ from USA

UK is densely populated. Unclear how this would impact spread rates.

UK currently experiencing Ash Dieback. Consequences of EAB addition is unclear.

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Model Transplant?

Not straight forward

Scottish environment and climate differ from USA

UK is densely populated. Unclear how this would impact spread rates.

UK currently experiencing Ash Dieback. Consequences of EAB addition is unclear.

Review progress

We found modelling articles for high priority species:

- 78 articles on Eurasian spruce bark beetle – *Ips typographus*
- 66 articles on Emerald ash borer (EAB) -- *Agrilus planipennis*
- 1 article on Great spruce bark beetle – *Dendroctonus micans*
- 0 articles were on Bronze birch borer – *Agrilus anxius*

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