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Centre of Expertise for Plant Health Annual Report April 2022 – March 2023





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Authors: Sonia Humphris¹, Damian Bienkowski¹ and Ian Toth¹

¹Centre of Expertise for Plant Health, James Hutton Institute, Invergowrie, Dundee, DD2 5DA

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ACRONYMS

BBB	Bronze Birch Borer
BioSS	Biomathematics and Statistics Scotland
CPHOS	Chief Plant Health Officer for Scotland (Gerry Saddler)
CoE	Centre of Expertise
CREW	Centre of Expertise for Waters
Defra	Department for Environment, Food and Rural Affairs
EPIC	Centre of Expertise on Animal Disease Outbreaks
ENRA	Environment, Natural Resources and Agriculture
Hutton	James Hutton Institute
HTA	Horticultural Trades Association
IPHC	International Plant Health Conference
IPM	Integrated Pest Management
KE	Knowledge exchange
MoA	Mode of Action
NPHW	National Plant Health Week
OCPHOS	Office of the Chief Plant Health Officer for Scotland
PCN	Potato Cyst Nematode
PHC	Plant Health Centre
PHRR	Plant Health Risk Register
PPP	Plant Protection Product
PSG	Pesticide Stakeholder Group
RBGE	Royal Botanic Garden Edinburgh
RESAS	Rural and Environment Science and Analytical Services
SART	Science Advisory and Response Team
SASA	Science and Advice for Scottish Agriculture
SEFARI	Scottish Environment, Food and Agriculture Research Institutes
SG	Scottish Government
SPHC	Scotland's Plant Health Conference
SRP	Strategic Research Programme
SRUC	Scotland's Rural College

1 EXECUTIVE SUMMARY/FOREWORD

The Plant Health Centre (PHC) Directorate have continued to work together to deliver a consistent programme of stakeholder engagement and project commissioning over the last 12 months. We have an established community of stakeholders who our Sector Leads engage with regularly to identify the needs of the different sectors and any potential plant health evidence/knowledge gaps. This has enabled us to commission a further 7 projects over the last year, 1 of which was a call down from Scottish Government (SG). These projects continue to be cross-sectoral wherever possible, ensuring that we address the main policy priorities of SG and are responsive to the needs of our stakeholders. The total number of projects commissioned by the PHC since its establishment is now 45. Thirty of these projects have been completed, and their reports and/or policy summaries are available on the PHC website, with 7 published in the last year.

A highlight from one of our published reports is [PHC2021/02](#): ‘Identifying the plant health risks associated with plant waste disposal and peat-free growing media and developing best practice guidance for waste disposal and composting across sectors’. This research focussed on two areas of biosecurity that provide significant risk to plant businesses and the wider environment in Scotland, i) plant waste management, and ii) the constituents of reduced-peat and peat-free growing media. Workshops were conducted with stakeholders in plant production (horticulture, agriculture, and forestry), park and garden management and managers of the natural environment, and a review of policy and related literature was performed to increase understanding of current practices and identify barriers to change for these aspects of biosecurity. Diagnostic work was also undertaken to provide evidence of the biosecurity risks posed by *Phytophthora* spp. in plant waste heaps and constituents of reduced-peat and peat-free growing media. The results indicated that biosecurity risk from plant waste is high, with two quarantine-regulated species, *P. ramorum* and *P. austrocedri* being identified. An evidence-led best practice guidance was produced to provide clear advice on how to achieve a well-managed waste disposal/re-use strategy. This guidance has become part of the Plant Health Management Standard so that organisations and businesses that are applying to become Plant Healthy Certified can identify what is required to raise their biosecurity standards. The findings also indicated that a thorough assessment of the potential plant health risks posed by each of the major constituents used in peat-free compost is required. SG felt this was an important knowledge gap to fill and discussions are underway to commission further work to undertake a comprehensive review on sources and processing methods for peat-free media.

An example of the policy impact of our projects is [PHC2020/03](#): ‘Plant Health Fellowship in the Natural Environment’. The Natural Environment sector underpins Scotland’s landscapes, biodiversity, rural industries and recreational activities, but the growing number of plant pest and diseases poses a significant threat to this sector and the rural economy. This fellowship, based at NatureScot and supported by the PHC, through stakeholder surveys and workshops, gained a better understanding of stakeholders’ awareness of the plant health risks associated with the natural environment, particularly with respect to habitat restoration and creation. In addition, it identified the plant pests and pathogens that threaten Scottish dwarf shrub heaths, and developed a framework for assessing risks to plant health in the natural environment and implementing actions to both reduce these risks and mitigate them if pests do establish. A major outcome of this fellowship was the identification of a knowledge gap around who was responsible for plant health in the natural environment. This is being further explored beyond the fellowship with NatureScot and the Chief Plant Health Officer for Scotland (CPHOS) to define responsibilities and develop protocols for plant health monitoring. The report highlights 11 recommendations that would reduce plant health risks for Scotland’s Natural Environment and has initiated next steps with key stakeholder groups to action these.

Knowledge exchange remains a top priority for the PHC and a key highlight from the past year was that Scotland's Plant Health Conference, a joint event between PHC, SG and its partner organisations, Scottish Forestry, NatureScot and HTA, returned to being an in-person event. The conference included presentations on existing and newly discovered plant health threats, updates on plant health policies and quick-fire updates on PHC commissioned projects. In addition, stakeholders participated in an interactive exercise to identify leverage points for improving biosecurity. Ms Lorna Slater, Minister for Green Skills, Circular Economy and Biodiversity, opened the event via video and, following an interesting day of talks and lively discussion, the conference was closed by Sallie Bailey, the Scottish Government's Deputy Chief Scientific Advisor for Environment, Natural Resources and Agriculture (ENRA).

The PHC was one of thirty organisations that signed the Public Engagement in Plant Health Accord, supporting the new [Plant Biosecurity Strategy for Great Britain](#). By working together, it is hoped the Accord will kick-start a national conversation to raise public awareness of biosecurity and promote positive behaviour changes to protect plant health. The joint campaign encourages travellers to make better biosecurity decisions when bringing plant material back to GB from other countries and when buying plants from online marketplaces and to ensure the public are aware of how to report sightings of pests and diseases.



Photo collage from Scotland's Plant Health Conference, Arable Scotland and the joint UK stand at the International Plant Health Conference.

There has been no change to the Directorate, SART or Steering Group personnel during the past year. The Directorate continue to meet fortnightly and have worked together to engage stakeholders, develop projects for commissioning, manage projects once commissioned and audit project outputs. The Secretariat has assisted with project development and management, have overseen the commissioning of projects and organised meetings, workshops and events and maintained the PHC's online presence. We have also met with OCPHOS and our Steering Group on a regular basis to enable us to capture the current policy priorities of the SG and our wider stakeholder network and reflect these in our commissioning process.

These highlights demonstrate the PHC's efforts to address plant health risks, improve knowledge and capacity, engage stakeholders and influence policies in Scotland.

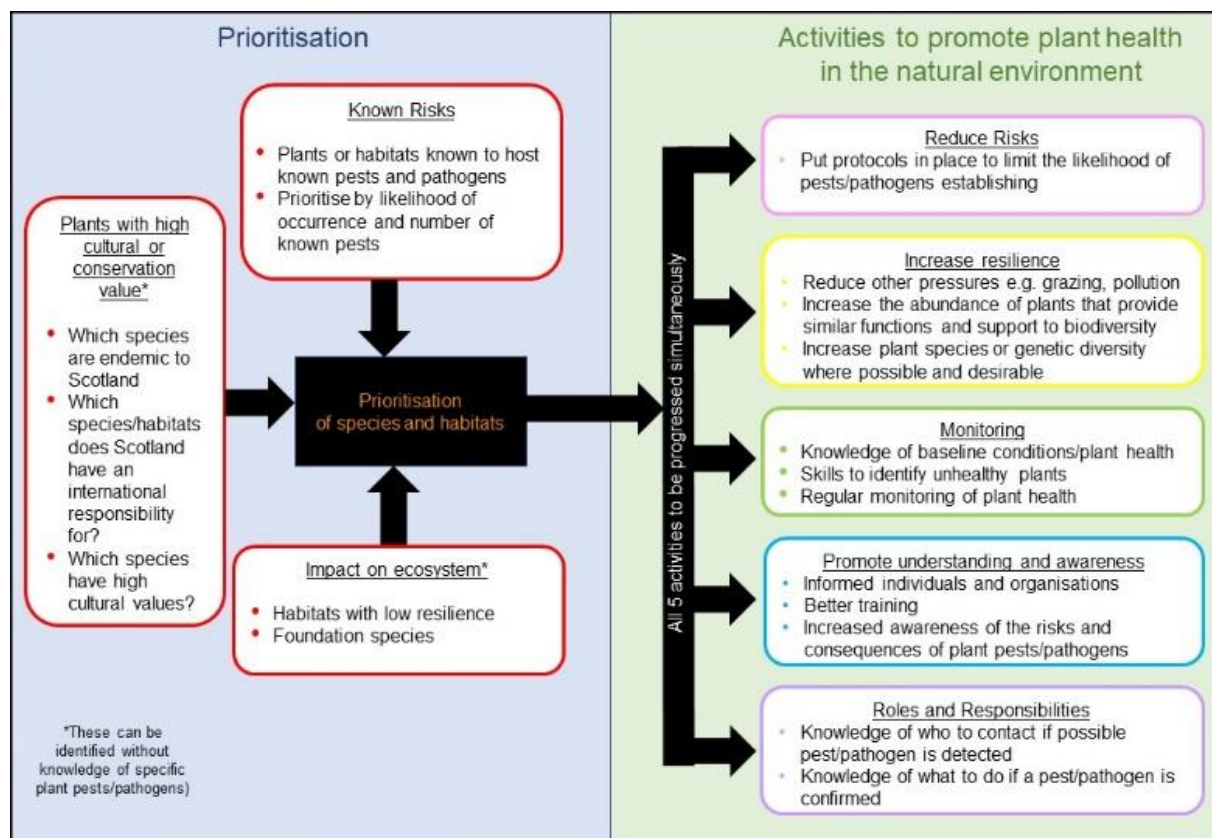
2 HIGHLIGHTS

Key highlights from the last 12 months are presented below.

2.1 Policy Impact and Leverage

Plant Health Fellowship in the Natural Environment

The Natural Environment sector underpins Scotland’s landscapes, biodiversity, rural industries and recreational activities, but plant health awareness is less well developed than in the forestry, horticulture and agriculture sectors. Following a series of discussions with NatureScot, the PHC funded a fellowship with them to address this gap including to, i) gain a better understanding of stakeholder awareness of plant health risks, particularly with respect to habitat restoration and creation, ii) identify pests and pathogens that threaten Scottish dwarf shrub heathlands (as an example of a non-woodland/forest habitat to highlight the risks to other habitats), and iii) develop a framework for assessing risks to plant health in the natural environment and implementing actions to both reduce these risks and mitigate them if pests do establish.



This work highlighted several potentially serious shortcomings with respect to risk assessments and biosecurity protocols in relation to habitat creation/restoration and identified a large number of pests that could potentially impact dominant plant species that occur on Scottish dwarf shrub heathland. As a result, a framework was developed (shown above) using the [PHC’s Key Principles](#) and [Defra’s tree health resilience strategy](#) as a foundation. This framework, together with information given in the report, was designed to i) help practitioners prioritise where plant health monitoring should be focused and ii) provide some overarching activities that can be implemented irrespective of specific pests, which will protect plant health and reduce the risks of plant pests establishing.

Recommendations from the fellowship include: (i) emphasising to stakeholders involved in habitat creation/restoration the importance of having both plant health risk assessments and biosecurity guidance/best practice protocols in place, and ensuring there is a named individual responsible for biosecurity; (ii) improvements to the UK Plant Health Risk Register (PHRR) to better include the impact of plant pest/pathogens on the natural environment, and to make it searchable by host rather than pest to enable easy identification of potential risks and help with conducting risk assessments, and (iii) using the pest lists collated here as an awareness raising exercise to highlight the risks to other non-woodland habitats.

A major outcome of this fellowship was the identification of a knowledge gap around who was responsible for plant health in the natural environment. This led to discussions in a wild plant health workshop with the CPHOS and others from SASA, NatureScot, SG and Forestry and Land Scotland to agree a way forward. This was the first time many involved in plant health had met with those involved in the natural environment, and the fellow and project has received praise for raising awareness and setting further actions in motion. It was agreed that a standard operating procedure for identification of, and response to, plant pests in the wider environment in Scotland would enable responsibilities to be better defined and reduce the risk of delays in appropriate action if important plant pests are suspected. As a result, a paper on wild plant health was presented to NatureScot science advisory committee, and plans are in place to develop protocols for suspected pest discovery and test case studies. If requested by the CPHOS, the PHC will commission further work to map plant health in the natural environment and identify exemplar species to trial protocols and plant health monitoring.

The fellow has submitted a manuscript for publication in the journal *Restoration Ecology* on the results of the questionnaire undertaken during the fellowship. Based on results of the fellowship, follow-on work has been carried out in the Environment, Natural Resources and Agriculture (ENRA), Strategic Research Programme (SRP) to expand risk assessment methods for Scottish dwarf shrub heathland to compare wider identification of habitats in the natural environment to determine those at greatest risk from plant pests and pathogens. This will enable practitioners to prioritise disease surveillance to those habitats that are at greatest risk. A manuscript based on this work has also been submitted to the journal *Biological Invasions* and a preprint is [available](#).

2.2 Outputs

In the past year, the PHC has commissioned a further 7 projects, of which 1 was a call down request from SG. This brings the total number of commissioned projects since the PHC was established to 45. Thirty of these projects are complete and their respective reports and/or policy summaries published on our website, 7 in the past year. Of the remaining projects, 11 are in progress and 4 have submitted reports under review by the Directorate and/or Steering Group.

2.3 Theme Highlights

The Centre's projects fall into two thematic areas (1) Evidence and Capacity: which assembles evidence and tools to identify areas of knowledge gaps and assesses and quantifies plant health risks; and (2) Solutions and Implementation: utilising information on risks to develop and evaluate practical solutions to prioritise plant health problems.

2.3.1 Highlight from Evidence and Capacity Theme

[A targeted analysis of the impact of insecticide withdrawals in Scotland, in the context of alternative control options](#)

Scottish agricultural, horticultural and forestry crop production systems rely heavily on the use of chemical insecticides. Regulatory controls are likely to reduce the availability of these active substances due to increasing concern over human health and environmental impact. At the same time, the efficacy of some insecticides is declining due to rising pest resistance. Alternative control methods used in Integrated Pest Management (IPM) are often more expensive and/or offer less effective protection. Maintaining yields, product quality and profitability will become increasingly challenging. This project analysed current crop production patterns and insecticide use in combination with how likely different insecticides are to be withdrawn and provided stakeholder views on the impacts of any such losses on their industry, including other control methods that may be adopted.



The analysis revealed that a high proportion of insecticide actives used in Scotland in 2019/20 are estimated to be at high or medium risk of withdrawal, and six have already lost their authorisations for use in the UK. Moreover, many of the common active substances have the same mode of action (MoA), meaning that if a target pest species develops resistance to an active substance, all products with the same MoA will provide less effective crop protection. Forestry and arable production are particularly exposed to this risk. The practical significance of withdrawal also depends on the availability and cost-effectiveness of alternative protection strategies. Stakeholder interviewees emphasized that withdrawal of active substances would negatively impact yields and quality whilst also raising production costs through increased reliance on less effective management practices, leading to decreased profitability and, in some cases render production unviable in some areas. Estimated production losses are subject to various uncertainties but ranged from £15m to £64m per

sector, with potential losses for forestry, potatoes, vegetables and soft fruit being particularly significant.

The results highlighted that, at present, an immediate loss of key insecticides is likely to have a very damaging impact on many Scottish farmers, growers and the supply chains that they serve. Allowing sufficient notice period and investment into developing varieties and IPM practices that work in the Scottish climate is recommended to mitigate some of those risks. A gradual, phased approach could help to protect employment in rural sectors and the wider Scottish economy. In addition, use of voluntary stewardship schemes can demonstrate the willingness of farmers, growers and foresters to work to reduce insecticide dependence where possible.

This work was a call-down request by SG following an action from the Pesticide Stakeholder Group (PSG). The PSG was established to address concerns from pesticide users and other stakeholders around the withdrawal, or significant changes to approval of, key plant protection products (PPP) under legislation on pesticide approval and use. It provides a forum for Scottish Ministers, SG officials, industry representatives and other interested stakeholders to discuss matters related to PPP authorisation and use that may have an impact in Scotland. The results of this work will be fed directly into the PSG and has provided SG policy much needed information on which to base the timeframe for phased withdrawals of pesticides, and on steps to take as mitigation against the plant health consequences to these sectors of vital importance to the rural economy.

2.3.2 Highlight from Solutions and Implementation Theme

Identifying the plant health risks associated with plant waste disposal and peat-free growing media, and developing best practice guidance for waste disposal and composting across sectors

Until recently, the presence and spread of plant pathogens in discarded growing media and waste plant material has seldom been considered as a management priority in plant nurseries, potentially posing significant plant health risks to all sectors. Closely related to this issue, is the phasing out of peat-based growing media. There is potential for some growing media constituents (which may include wood-based materials, green compost and coconut fibre [coir],) to contain plant pathogens, but there has been very little work done to determine the nature and level of risk that this might pose to plants being grown in peat-free growing media.

This project engaged with stakeholders in plant production (horticulture, agriculture, and forestry), park and garden management and managers of the natural environment via workshops, and conducted a review of policy and related literature, to increase understanding of current practices and identify barriers to change. Diagnostic work was also undertaken to provide evidence of the biosecurity risks posed by *Phytophthora* spp. in plant waste heaps and constituents of reduced-peat and peat-free growing media, as they are a genus of plant pathogens well known to be spread via the plant trade.

The results of this work indicated that the biosecurity risk from plant waste is high, with two quarantine-regulated species, *P. ramorum* and *P. austrocedri* being identified. There was a lack of clear sector-wide advice, meaning that plant waste management practices are varied and, although practitioners are very keen to improve plant waste management, there is an uncertainty of what to do about it. Uncertainty surrounding the provenance and safety of growing media constituents, along with the other challenges of changing to reduced-peat and peat-free growing media, is causing particular concern. The concurrent 'in kind' diagnostic study of *Phytophthora* in peat-free growing media detected DNA of different *Phytophthora* spp. in constituents of peat-free media (chopped bark, coir and composted green waste).

The outcomes from this project include: (i) specific, clear, evidence-led advice in the form of a guidance document on the effective management of plant waste so that it can be reused or safely disposed of. [This guidance document](#) can be used by managers to assess risk and improve biosecurity and (ii) informing the Plant Health Management Standard so that organisations and businesses applying to become Plant Healthy Certified can help to raise their biosecurity standards.

Knowledge exchange activities are being planned to promote the guidance document and outcomes of this project. This will include the project lead, on invitation, being asked to open a [Green Waste Management in Gardens workshop](#).

A recommendation in the [project report](#) was that a thorough assessment be performed of the potential plant health risks posed by each of the major constituents used in peat-free growing media, including detailed information on product source, processing treatments, transportation and storage methods. John Speirs, SG Plant Health Policy and member of our Steering Group, felt it was important to address this knowledge gap and discussions are underway to commission further work to undertake a comprehensive review on sources and processing methods for peat-free media.



2.4 Knowledge Exchange

Scotland's Plant Health Conference

Scotland's Plant Health Conference, a joint event between PHC, SG and its partner organisations, Scottish Forestry, NatureScot and HTA, went back to being an in-person event last year. This one-day conference took place in Dundee on Wednesday 1st June and was targeted at stakeholders from, and involved in, the horticulture, landscaping, forestry and agriculture sectors. The event was attended by over 100 delegates and the CPHOS Gerry Saddler introduced the day, before its official opening by the Minister for Green Skills, Circular Economy and Biodiversity, Lorna Slater MSP. A series of presentations covered serious existing threats, such as potato cyst nematodes on potato, and newly discovered ones including *Phytophthora pluvialis*, which is affecting western hemlock and Douglas fir trees. There were also key updates from Scottish Government on the latest plant health policies, which complemented talks by key sector members and their plans for improving plant health biosecurity.

Project leads from PHC funded projects gave a series of quickfire project updates, with an accompanying poster for further discussion during the poster session. In addition, the project leads for PHC2021/08 (Action research to gain a deeper understanding of large-scale biosecurity risks to Scotland) used the conference as an opportunity to capture insights from a wide range of stakeholders by running an interactive exercise to help achieve their project aim of identifying leverage points for change within selected key organisations to improve biosecurity.



Following an interesting day of talks and lively discussion, the conference was closed by Sallie Bailey, the Scottish Government's Deputy Chief Scientific Advisor for ENRA.

The International Plant Health Conference (IPHC)

The IPHC was one of the main legacies of the [International Year of Plant Health 2020](#) and was originally planned to be held in Finland in 2020, but was postponed due to the COVID-19 pandemic and instead took place from 21 to 23 September 2022 at the Queen Elizabeth II Centre in London, United Kingdom. The IPHC convened countries from around the world to discuss global scientific, technical and regulatory issues related to plant health aiming to contribute to a number of the UN Sustainable Development Goals, amongst other objectives. Representatives from PHC attended and contributed, along with SG, to this important event by participating in a joint, Defra-led, UK stand with a theme of 'Working Together to Protect UK Biosecurity' (see images below). This allowed us to raise the profile of the importance of plant health to Scotland's iconic native species and cultivated plant-based assets and to build and strengthen our connections with national and international colleagues.



Duncan Allen (Defra) dressed as the Asian Longhorned Beetle and Gerry Saddler (CPHOS) and Ian Toth (Centre Director) promoting the PHC Key Principles at the joint UK stand at IPHC.

3 ANNEX A: Summary of all Activities

3.1 Plant Health Centre Team

Directorate (Director, Sector Leads and Secretariat)

The Directorate have continued to work together to deliver a consistent programme of stakeholder engagement and project commissioning over the last 12 months. We have an established community of stakeholders who our Sector Leads engage with regularly to identify the needs of the different sectors and any potential plant health evidence/knowledge gaps. We continue to meet fortnightly to manage progress and strategy, and to prioritise sector-specific and cross-sector needs for commissioning of projects. The Directorate and Sector Leads oversee the delivery of projects and audit all project outputs including the final reports and policy summaries. We have also maintained regular meetings with OCPHOS to ensure we are responsive to the Government's priorities and have organised a workshop with SG Plant Health Policy and OCPHOS to discuss categorising the impacts of some of our previous projects and whether the impacts are being fully exploited and how we can work together to ensure we make full use of impacts from future projects.

In addition, the Directorate successfully re-tendered for the new PHC programme. Submission of the tender documents and pricing schedule was co-ordinated and managed by the Centre manager and involved many hours of input from the whole Directorate, including an in-person meeting to plan and review the management structure of the current Centre and how we could improve this with greater emphasis on stakeholder engagement and communication.

Secretariat (Manager and Facilitator)

The Secretariat continue to be responsible for the day-to-day management of the centre and assist with the development and management of projects as well as overseeing the commissioning and procurement of projects. They managed liaison between the PHC members and between the PHC, SRP and other CoEs, have organised events, meetings and workshops, prepared the PHC bulletins, and maintained and updated the PHC social media presence and website.

Science and Advisory Response Team (SART)

The SART have continued in their role as a conduit to the research community for the purposes of project refinement, as well as a source of indirect stakeholder contact, and serving as a pool of plant health expertise, with many leading, or participating in, commissioned projects in the 22-23 reporting period.

Steering Group

We have held 3 Steering Group meetings over the past year that have provided opportunities for the group to review PHC activities, provide strategic advice and guidance, and input to our project calls to ensure the PHC priorities are aligned with stakeholder needs. They also audit all project reports and policy summaries prior to publication on our website. There has been no change to the membership of our Steering Group in the last year and all members have agreed to continue in their role in the new PHC programme. However, it was agreed that the OCPHOS would look for a member to join the Steering Group from Scottish Environment LINK to strengthen the representation of the environment sector.

3.2 Policy Impact and Enhanced Capacity

In addition to the highlights in Section 2, we have also demonstrated the following impact and enhanced capacity over the past 12 months:

Plant Health Accord

The new [Plant Biosecurity Strategy for Great Britain](#) was released on the 9th of January 2023, setting out a new vision for plant health over the next 5 years and how GB will work together to protect plant biosecurity. One of the objectives to support this vision is ‘A society that values healthy plants’ and to help achieve this goal, thirty organisations, including the PHC, have signed the [Public Engagement in Plant Health Accord](#). By working together, it is hoped the Accord will kick start a national conversation to raise public awareness of biosecurity and promote positive behaviour changes to protect plant health. This includes looking at behavioural interventions to support travellers to make better biosecurity decisions when bringing plant material back to GB from other countries and when buying plants from online marketplaces. The PHC participated in a workshop to discuss how to turn behavioural interventions into messaging strategies and are working with the other signatories to co-ordinate and plan activities and plant health messaging for National Plant Health Week 2023.

Dandelion Project

[Dandelion](#) was commissioned by EventScotland and funded by SG and was Scotland’s contribution to UNBOXED: Creativity in the UK, so was one of 10 major creative projects that took place during 2022. Dandelion gave the PHC a chance to spread the principles of good plant health to new audiences. The Dandelion project’s free programme inspired people in Scotland to Sow, Grow and Share, and aimed to make growing food as easy and accessible as possible for people of all ages and backgrounds.

It was a great opportunity to introduce people to the fact that plants get sick too, and to share what they could do to help. The PHC ran plant clinics at two festivals of music and growing events in Glasgow and Inverness, enabling people to ask for advice and look at the plant health resources on show. We created resources on safe and sustainable growing media and promoted the [PHC Key’s Principles](#) such as ‘Sourcing with Care’ and ‘Keeping it Clean’. There was a special programme for schools and they had access to our specially created [‘Totally Tatties’ guidance](#). Dandelion was a one-year project, but the plant health resources will be kept live by working with Keep Scotland Beautiful in 2023.



Modelling Framework for Invasive Pests

As part of his role in the PHC SART, Adam Kleczkowski has concentrated on the further development of the generic Decision Support Tool (DST) for use by the PHC, SG and Forestry Commission Scotland. The framework is based on the 2018-19 project funded by the PHC ([PHC2018/14](#)) and assists in the provision of emergency advice and analyses in the event of an outbreak and horizon scanning. Adam leveraged the contribution of a highly experienced computing technician and continued the work on improving the efficiency of the DST. The DST is now fully implemented on a secure server at the University of Strathclyde instead of external AWS servers. This also enabled further increases in the speed of calculations. An appropriate version control system has now been implemented, which allows tracking software development. The assistance of the technician was instrumental in developing the successful application for PHC project [PHC2022/04](#) (‘Assessing long-term resilience of Scottish Sitka Spruce forests to climate change and novel pests’). A draft DST for Sitka spruce forests was developed and was used in the preparation of the grant application.

3.3 Communications and Networking

The directorate have hosted, taken part in and attended regular events throughout the year, including Scotland's Plant Health Conference, the International Plant Health Conference, Action Oak Partner Event, UKRI Future Treescapes 2022 Conference, PCN Action Scotland Winter meeting, Potatoes in Practice, Arable Scotland, a Gene Editing workshop and the Association of independent potato consultants. We use these opportunities to promote the work of the PHC, and both engage with stakeholders and extend our stakeholder community. In addition, the Director and Sector Leads are members of several advisory groups and committees, including the UK Science Partnership for Animal and Plant Health, the Centre for Forest Protection Board, Action Oak Steering Committee and Action Oak Research and Monitoring Committee, the National Species Reintroduction Forum, International Barcode of Life, Science Committee for Centre for Biodiversity Genomics. Pesticides Stakeholder Group, Scottish Voluntary Initiative, Association of Crop Protection Northern Britain, as well as being honorary Professors at a number of universities both nationally and internationally.

In addition, the PHC:

- Met Lorna Slater (Minister for Green Skills, Circular Economy and Biodiversity) and Plant Health Policy at RBGE to talk about the work of the PHC (see image below).
- Arranged a meeting with Mat Williams, Sallie Bailey (SG Chief Scientific Advisor for ENRA and Deputy, respectively) and Kim Davie (SG Principal Science Advisor) at the James Hutton Institute to promote the work of the SRP and PHC and to discuss the crop science taking place at the Institute. This opportunity arose during a discussion with Sallie Bailey at Scotland's Plant Health Conference in June 2022.
- We were also asked to introduce the IPM plans to Ms Lorna Slater at the Royal Highland Show during a meeting between the minister and the Scottish Voluntary Initiative



Meeting with Lorna Slater (Minister for Green Skills, Circular Economy and Biodiversity), Caspian Richards (Head of Policy and Pesticide Survey unit) and the Gerry Saddler (CPHOS), together with Chris Quine (Sector Lead for Forestry), Ian Toth (Centre Director), Fiona Burnett (Sector Lead for Agriculture) and Pete Hollinsworth (Sector Lead for Horticulture and the Natural Environment) at RBGE.

National Plant Health Week (NPHW)

Following the International Year of Plant Health in 2020, the UK introduced a NPHW in May every year to promote biosecurity messages and increase the public's awareness of plant health threats. As part of NPHW, we published a blog entitled "Plant Health Centre funded research informs real-world improvements in plant biosecurity". The blog was penned by the project leads of two of our recently funded projects that aim to clarify the risks associated with a) plant waste disposal and peat free media, and b) visitors to sites, tools and machinery movement, and to identify solutions for all live plant handlers.

The publication of our [project report](#) on 'Improving knowledge of *Xylella fastidiosa* vector ecology: modelling vector occurrence and abundance in the wider landscape in Scotland', coincided with International Plant Health Day (12th May). We used this opportunity to promote the findings of this project and to remind the public of the 'Don't Risk It' campaign and the threat that *Xylella* poses.

Website and Social Media

Both our website users and Twitter audience have continued to grow over the last 12 months, with our Twitter followers increasing from 1072 to 1252 and our website users passing 26,000. While these are mainly based in the UK, we also have international users, including America, Europe, China and India, highlighting the reach of the PHC beyond Scottish and UK stakeholders. We continue to highlight the work and outputs of the PHC commissioned projects on our website and our most downloaded project over the last year was [PHC2021/02](#): 'Identifying the plant health risks associated with plant waste disposal and peat-free growing media and developing best practice guidance for waste disposal and composting across sectors'. Despite only being published in March 2023, it has received 105 downloads. Other popular reports include [PHC2020/04](#): 'Improving knowledge of *Xylella fastidiosa* vector ecology', [PHC2021/03](#): 'Review of gene editing for the benefit of plant health' and [PHC2020/01](#): 'PCN working group report'. Our [blog page](#) has received over 900 page views, with our most read blog over the past year being one written by two members of our SART and Directorate and entitled 'Sudden Larch Death – an invasive tree killer and how you can do your bit to help'. The [PHC Knowledge Bank](#) is still proving to be a valuable resource with 318 views. In addition, 876 [IPM plans](#) have been completed over the last 12 months.

Joint Working with CoEs and SRP

We have continued to work closely with other CoEs, including a joint meeting to coordinate website development plans and open access across the CoEs, sharing processes and procedures with CREW, which is also managed by the Hutton, and representation on Safari Gateway Operational Group. In addition, EPIC and PHC colleagues met to discuss how we can engage with each other and explore where there might be common interests. Following discussions, we have proposed that the PHC commission a small project to bring together EPIC scientists with the PHC Directorate and other relevant stakeholders to identify and discuss activities of common interest. This will include the development of draft plans that may be used by the PHC to commission projects in later years, either as standalone projects, or complementing future work in EPIC. Although the PHC will fund the majority of costs for this project, EPIC will include it as a deliverable in the EPIC Action Plan. This proposal has been approved by both Nia Ball and Kim Davie.

Several PHC projects have close links with the SRP, with each helping to strengthen the findings of the other. For example, i) the Potato Cyst Nematode (PCN) project [PHC2020/08](#) used modelling techniques that are being improved in the SRP to help with future PCN analyses, to improve risk assessment and to better develop decision support tools; ii) Understanding perceptions to IPM project [PHC2022/02](#) links to the SRP, which is developing new IPM tools and working with industry to co-construct solutions, develop optimal IPM management practices and trial strategies; and iii) the Fellowship in the natural environment

[PHC2020/03](#), which has laid the foundation for further work on the SRP including an analysis of risks in a wider range of natural habitats, a UK-wide analysis and an expansion of the ways of ranking risk. Where projects arise with possible links to the SRP, the Director, Manager and or Sector Leads discuss the work with the relevant Topic lead to ensure no duplication of work is taking place.

3.4 Project Summaries

In total, the PHC has commissioned 45 projects over the last 5 years that have involved 120 experts, 110 from outside the PHC's Directorate and SART, representing 24 organisations. These projects fall into the two Themes described above: Evidence and Capacity (Theme 1) and Solutions and Implementation (Theme 2). All our projects are cross-sectoral, wherever possible, and are assigned a policy contact from within SGs plant health team to ensure our projects are addressing the main policy priorities of SG and addressing the evidence needs of stakeholders.

Last year, with agreement from our Steering Group and CPHOS, the PHC advertised an open call, 'Enhancing preparedness against pests and diseases: plugging evidence gaps for Scotland'. The call emphasised the need for a strong evidence base to effectively address plant health threats and we sought to commission multiple research projects to fill knowledge gaps, as presented by potential providers who are experts in their respective fields. By generating tailored evidence, the aim was to improve Scotland's preparedness and resilience against a wide range of future threats to plant health. We received a number of excellent applications, and four projects were commissioned (summaries below) and a further two projects were marked as suitable for funding in our next funding cycle.

A summary of all projects commissioned, in-progress, or completed in the past year is below.

3.4.1 Call down projects

Call down projects commissioned in 2022-2023 are described below.

PHC2022/02: Understanding farmer / agronomist perceptions for decision making in crop health and the impact of that on key metrics such as IPM scores and pesticide usage

Requested by: SG Policy and Pesticide Survey Team (Allan McIvor and Gillian Reay)

Delivered by: SRUC, SAC Consulting, The James Hutton Institute, SASA

Sectors: Agriculture

Theme: 2

Start Date: 27/02/2023 End Date: 30/11/2023

[Link to Project](#)

Summary: Previous research shows that better informed farmers and agronomists can make better IPM decisions and score higher in IPM metrics ([PHC2020/05](#)). Research has also identified that decision making on farm is often shared between the farm agronomist and the farmer. However, there is a knowledge gap on how factors influencing IPM scores link to available impact metrics such as pesticide usage. PHC2022/02 will look to improve the flow of IPM knowledge and its uptake to increase the resilience of Scotland's crops to pests and diseases, whilst reducing reliance on pesticides. The drivers and barriers to further adoption of IPM practices for different decision makers and for different farm types will be identified, improving the ability to tailor IPM research and knowledge transfer and exchange activities to consider, if not overcome, those barriers and improve uptake.

3.4.2 Standard projects commissioned during this reporting period

Standard projects commissioned in 2021-2022 are described below.

PHC2022/03: Potential of biocontrol for the sustainable management of plant diseases in Scotland: Opportunities and barriers

Requested by: Stakeholder engagement, approved as priority for funding by CPHOS

Delivered by: SRUC, Royal Botanic Garden Edinburgh

Sectors: Forestry, Agriculture, Horticulture

Theme: 1

Start Date: 01/02/2023 End Date: 31/08/2023

[Link to Project](#)

Summary: Previous PHC projects identified biocontrol as a major element of Integrated Pest Management (IPM) with a role to play in mitigating pesticide withdrawals. However, it is currently unclear how practical biocontrol is as a suitable alternative to pesticides in Scotland, what the opportunities are for deployment across different sectors and what barriers exist to uptake (including regulatory). Research on biocontrol agents is required to understand a) what relevant previous work has taken place, b) the potential benefits for agricultural, horticultural and forestry applications in Scotland, and c) is the current risk assessment framework and regulatory system fit for purpose? This project will improve our understanding of the potential of biocontrol agents in Scottish production systems and gardens; synthesising findings from workshops with stakeholders and literature review.

PHC2022/04: Assessing long-term resilience of Scottish Sitka spruce forests to climate change and novel pests: A bark-beetle case study

Requested by: Project selected from Open Call applications (“Enhancing preparedness against pests and diseases: plugging evidence gaps for Scotland”) after PHC Directorate and OCPHOS assessment. Approved as priority for funding by CPHOS

Delivered by: University of Strathclyde, Forest Research, Forestry and Land Scotland
Sectors: Forestry, Natural Environment

Theme: 2

Start Date: 01/02/2023 End Date: 31/12/2023

[Link to Project](#)

Summary: This project seeks clarity on how Scottish Sitka spruce forests might respond to further increases in pressure from climate change and existing or new pests and their potential synergistic effects. Building on an existing decision support tool developed as part of a previous PHC funded project ([PHC2018/14](#)), the project will produce an updated modelling framework with key processes and parametrisations for *D. micans* (present in Scotland) and an initial assessment for *I. typographus* (invasive) risks under changing climate. Initial economic analysis of the impact of different scenarios will also be produced, as well as pathways for incorporating future research results. The project was jointly developed with Scottish Forestry and Forestry and Land Scotland who will be involved throughout the process, particularly in developing the policy advice and bringing in industry views, including during workshops that will assess the modelling framework, with recommendations being incorporated into the final version.

PHC2022/05: Interdisciplinary analysis of plant health threats to arable and horticultural crops in Scotland

Requested by: Project selected from Open Call applications (“Enhancing preparedness against pests and diseases: plugging evidence gaps for Scotland”) after PHC Directorate and OCPHOS assessment. Approved as priority for funding by CPHOS

Delivered by: University of Exeter, The James Hutton Institute

Sectors: Horticulture, Agriculture

Theme: 1

Start Date: 28/02/2023 End Date: 31/12/2023

[Link to Project](#)

Summary: PHC2022/05 will take a unique cross-disciplinary approach using biophysical risk modelling combined with social science methods to analyse the threat from emerging plant health threats to both arable and horticultural crops in Scotland. From this project there will be an improved understanding of potential risks from plant pathogens under future climate scenarios to inform future priorities for pathogen detection and surveillance efforts. The biophysical modelling will be added to with qualitative data from existing Scottish Government funded stakeholder consultation research. PHC2022/05 will also identify knowledge gaps for further research, such as in biology, host distributions, and other biophysical factors influencing pathogen spread as required by the model, as well as a shared understanding with stakeholders of priority concerns regarding future plant health risks.

PHC2022/06: Gibase 2.0: Enhanced preparedness in Scotland's Green Infrastructure

Requested by: Project selected from Open Call applications ("Enhancing preparedness against pests and diseases: plugging evidence gaps for Scotland") after PHC Directorate and OCPHOS assessment. Approved as priority for funding by CPHOS

Delivered by: St. Andrews Botanic Gardens, Myerscough College, Gothenburgh Botanic Garden, Forest Research

Sectors: Forestry, Horticulture

Theme: 2

Start Date: 01/02/2023 End Date: 31/12/2023

[Link to Project](#)

Summary: PHC2022/06 builds on an outcome from a previous PHC project ([PHC2019/05](#)) which created Gibase 1.0: A database of green infrastructure plant species in England and Scotland, which was built by searching local authority planning portals for plant specifications associated with Green Infrastructure projects. This project will extend the database, creating Gibase 2.0, establishing search functions for planning portals across Scotland, automatically generating notifications of projects that meet specific criteria relating to project scale and type. This will allow both higher resolution data to be recorded and also ensure that Gibase 2.0 captures the most current schemes under development or in early-stage planning. This project will map the diversity and abundance of plant species used in green infrastructure across Scotland, and record this data in Gibase 2.0. It will use the UK PHRR to create relative risk profiles for each plant species and, for commonly planted species, create high quality data sheets using published research, providing a valuable asset to policy-makers, local planning authorities, green infrastructure designers and developers.

PHC2022/07: Understanding an emerging health threat to Caledonian Scots pine (*Pinus sylvestris*)

Requested by: Project selected from Open Call applications ("Enhancing preparedness against pests and diseases: plugging evidence gaps for Scotland") after PHC Directorate and OCPHOS assessment. Approved as priority for funding by CPHOS

Delivered by: Forest Research, Royal Botanic Garden Edinburgh

Sectors: Forestry, Environment

Theme: 1

Start Date: 01/02/2023 End Date: 31/12/2023

[Link to Project](#)

Summary: PHC2022/07 aims to utilise existing Scottish resources to fill in key evidence gaps so that threats to Caledonian Scots pine can be better understood, and potential mitigating measures identified. PHC2022/07 was proposed due to unusual disease symptoms on

Caledonian Scots pine (*Pinus sylvestris*) located in the Aviemore area of Scotland having recently been investigated by the Tree Health Diagnostic and Advisory Service of Forest Research. This project will carry out a targeted survey of Caledonian pine in Scotland to assess the extent and incidence of symptoms and to collect samples; compare and identify to species level isolates of potential causal agents collected from native Scots pine and determine their phylogenetic placement and genetic diversity; develop an effective inoculation method through studies of the infection process on needles and woody tissues of Scots pine, and; determine the pathogenicity of the causal agent(s) on Scottish provenances of Scots pine.

PHC2022/08: Plant Biosecurity Resources – increasing the accessibility of notifiable plant pest information for Professional Operators

Requested by: Stakeholder engagement, approved as priority for funding by deputy CPHOS

Delivered by: Plant Health Alliance, Royal Botanic Garden Edinburgh

Sectors: Forestry, Horticulture, Agriculture, Environment

Theme: 2

Start Date: 20/03/2023 End Date: 20/10/2023

[Link to Project](#)

Summary: This project addresses concerns that stakeholders, many of which will be registered as professional operators and issuing plant passports, are lacking confidence in their notifiable pest risk knowledge. For example, they find the UK PHRR an intimidating resource that cannot be searched by plant host species. The project will address this issue by providing professional operators with the critical information on notifiable pests, in an easily accessible format, in order to meet their legal responsibilities. PHC2022/08 will create summary overview documents that cross references the 39 notifiable pests (from the PHRR) with management measures and the requirements of the Plant Health Management Standard. Therefore, plant pest information will be presented in manner to support businesses and organisations conduct a Site and Operations Pest Risk Analysis.

PHC2022/08 is match-funded by Defra.

3.4.3 Project reports completed/published during this reporting period

The following standard project reports have been published in the last 12 months.

PHC2020/04: Improving knowledge of *Xylella fastidiosa* vector ecology: modelling vector occurrence and abundance in the wider landscape in Scotland

Requested by: Project approved by CPHOS following recommendation in previously funded *Xylella* projects (PHC2018/04/05 and 06)

Delivered by: University of Stirling, UKCEH, Forest Research, SASA and SRUC

Sectors: Forestry, Horticulture, Agriculture, Environment

Theme: 1

Start Date: 25/03/2021 End Date: 07/01/2022 Publication Date: 12/05/2022

[Link to Publication](#)

Summary: The insect-vector, bacterial plant pathogen *Xylella fastidiosa* is currently absent from Scotland and the wider UK, but if introduced could be a serious threat to trees and other plants. However, there is a lack of knowledge about the ecology and distributions of *Xylella* vectors in Scotland and the potential effects of this on any outbreak of the disease, which this project aimed to address. Sampling of xylem-feeding potential vector insects (order Hemiptera, Aphrophoridae and Cicadellidae families) was conducted in 2021, including weekly sampling of different habitats at Loch Leven, Fife, and a wider survey across 16 sites in central Scotland. Overall, this project has provided government with a better understanding of vector phenology, species composition and habitat preferences in Scotland, as well as guidance for sampling vectors and controlling future outbreaks. It highlights a previously

unappreciated risk to Scottish heathland, though this should be set in the overall context of a less suitable climate for *Xylella* outbreak growth and impact at present. Better understanding of vector dispersal ranges and of *Xylella* transmission and disease progression in heathland plants under Scottish climatic conditions would further inform on the potential risk of introducing *Xylella* to Scotland.

PHC2020/05: Identifying links between farmer and agronomist perceptions on pest and disease risk, the information sources they use to determine pesticide usage and the uptake of IPM methods

Requested by: SG Policy and Pesticide Survey Team (Allan McIvor and Gillian Reay)

Delivered by: SRUC

Sectors: Agriculture, Environment

Theme: 1

Start Date: 01/03/21

End Date: 31/05/2022

Publication Date: 17/11/2022

[Link to Publication](#)

Summary: Pesticide use remains an important tool in managing pest, weed and disease risks to crops and maintaining profitable production. There are several drivers for reducing reliance on pesticides and promoting the uptake of more sustainable practices through integrated pest management (IPM). By identifying IPM information networks it may be possible to improve the flow of information to farmers by targeting their preferred information sources. This project undertook a telephone survey of 267 farmers and 26 agronomists and some of the key findings include:

- The agronomist group/company had the biggest influence on farmers IPM score.
- Many other factors were found to influence IPM uptake including farmer age, location and size of enterprise.
- Agronomists and farmers acquire IPM knowledge from a range of information sources, the most popular being their peers, research organisations, farming press, levy boards and professional memberships.
- The biggest barrier to further IPM uptake was 'time and effort required to increase knowledge of IPM' for farmers.

The research also identified ways in which information flows could be improved to increase IPM uptake including developing a knowledge transfer and exchange strategy for both farmers and agronomists that utilises the most effective outlets such as farming press, levy boards, research organisations and professional memberships.

PHC2020/07: Enhancing the Plant Health Centre's communication with stakeholders

Requested by: CPHOS following development of the PHC engagement strategy

Delivered by: Hutton

Sectors: Forestry, Horticulture, Agriculture, Environment

Theme: 2

Start Date: 10/05/2021

End Date: 31/05/2022

Publication Date: 22/01/2023

[Link to publication](#)

This project was commissioned to implement a selection of the recommendations made in the PHCs stakeholder engagement strategy and communication plan. PHC2020/07 developed strategies to manage time and resources of the PHC more efficiently regarding communication of outputs, general information on activities, aims and current issues related to plant health. Over the course of the project the social media presence of the Centre was increased, a website 'refresh' was performed to improve accessibility of content (the website now conforms to current accessibility criteria), the PHC slide presentation template was updated the Centre's [Key Principles](#) were rebranded to keep them at the forefront of all PHC knowledge exchange.

Recommendations on future collaborations and potential funding streams that the PHC could leverage to support new knowledge exchange initiatives and to improve PHC communication were captured in the final report.

PHC2020/08 - Modelling the spread of PCN in Scotland to identify the key factors responsible and the most appropriate management options for future mitigation

Requested by: PCN Working Group recommendation.

Delivered by: The James Hutton Institute

Sectors: Horticulture, Agriculture

Theme: 1

Start Date: 11/04/2021

End Date: 10/01/2022

Publication Date: 03/03/2023

[Link to Publication](#)

Summary: Potato cyst nematodes (PCN) cost Scottish agriculture over £25 million/year and threatens food security in the developed and developing world. Improved understanding of PCN epidemiology is a priority for the Scottish potato industry, with spatial and temporal modelling identified by the recent PHC PCN working group as essential components. The aim of this project was to gain a better understanding of the spatial epidemiology of PCN in Scotland, by applying mapping, statistical and artificial intelligence (machine learning) techniques to existing landscape-scale datasets. Several factors were shown to influence the presence of PCN in fields, either positively or negatively, which may help to better understand how management practices could be used to help reduce the presence of the pest. These principal drivers of PCN incidence were used to create a machine learning model that can predict PCN incidence to an accuracy of 82%. Further work is planned to develop predictive tools for PCN for the potato industry under the [SG funded PCN project](#) and SRP 2022-2027.

2021/01: Biosecurity practices to support plant health: a review of knowledge and practice

Requested by: Stakeholder engagement, approved as priority for funding by CPHOS

Delivered by: RBGE, Plant Health Alliance

Sectors: Forestry, Horticulture, Agriculture, Environment

Theme: 2

Start Date: 05/01/2022

End Date: 31/05/2022

Publication Date: 03/03/2023

[Link to Publication](#)

Summary: This research investigated plant biosecurity risks from site visitors, tools & equipment, and large machinery. In addition to reviewing published guidance, UK businesses and organisations were engaged via questionnaires and interviews to explore how these aspects of biosecurity are understood and what procedures may be in place to address them. By better understanding the issues faced by individuals attempting to protect their businesses and organisations from these risks, more appropriate guidance can be produced to help them. This review has gained a good understanding of current biosecurity practices across sectors in Scotland, highlighting the need for clear, evidence led, sector-relevant, biosecurity guidance for businesses and organisations managing the biosecurity risks associated with visitors, tool hygiene and machinery movement. Biosecurity success is likely to depend on coordination across sectors through a shared understanding of the issues and aligned activity to address them. Assessing risk is very difficult for organisations and therefore a key recommendation of the report was the requirement for a simple resource showing the highest risk and notifiable pests for each sector that would greatly help organisations trying to understand risk.

PHC2021/02: Identifying the plant health risks associated with plant waste disposal and peat-free growing media, and developing best practice guidance for waste disposal and composting across sectors

Requested by: Stakeholder engagement (and SART workshop). Approved as priority for funding by CPHOS

Delivered by: RBGE, Plant Health Alliance, Forest Research and Earthcare Technical Ltd
Sectors: Forestry, Horticulture, Agriculture

Theme: 2

Start Date: 05/01/2022

End Date: 30/09/2022

Publication Date: 03/03/2023

[Link to Publication](#)

See highlight section 2.3.2 for summary

PHC2021/04: Groundkeeper mapping for PCN control

Requested by: deputy CPHOS (Denise A'Hara)

Delivered by: SoilEssentials and SASA

Sectors: Agriculture

Theme: 2

Start Date: 02/05/21

End Date: 31/08/22

[Link to Publication](#)

Summary: Potato Cyst Nematode (PCN) is a growing threat to the seed potato and flower bulb sectors of Scotland's rural economy. Poor control of groundkeepers (unharvested potatoes that regrow during subsequent crops) enables PCN populations, along with other pests and pathogens, to increase between potato rotations. This greatly undermines the usefulness of rotations in reducing PCN in the soil. A reduction in groundkeeper occurrence, through better control, would have a major impact on the presence of PCN. PHC2021/04 generated data using aerial imagery (drone capture), combined with targeted soil sampling, that compared soil PCN levels from locations with/without groundkeepers. The results from this work have, as per the contract objective, fed directly into the new [SG funded PCN project](#) and formed part of the first-year annual report.

3.4.4 Projects under review by the Directorate/Steering Group

All project outputs (including reports, policy summaries, guidance documents, etc) are reviewed by the relevant sector lead (under review by Directorate) and comments/edits fed back to the project lead. These can either be minor revisions, with the centre manager approving revisions, or major, with the revised documents being reviewed again by the relevant sector lead. Once the outputs have been satisfactorily revised by the project lead, they are passed to the Director for approval (under review by Directorate), before being passed to the Steering Group for final audit and approval for publication (under review by Steering Group).

PHC2018/12 - Integration of Plant Health planning into the new Scottish Biodiversity Strategy (under review by Directorate)

Requested by: Stakeholder Engagement during workshop at PHC conference in 2018.

Approved as priority for funding by CPHOS

Delivered by: RBGE, James Hutton Institute, SASA

Sectors: Forestry, Environment

Theme 2

Link to [Project](#)

Start Date: 18/03/2019

End Date: 30/11/2022

Summary: The impacts of introduced plant pests and diseases have been substantial in recent times. With a changing climate and many known pests on the horizon, plant health impacts on biodiversity are expected to grow further in the years ahead. Thus, considering the nature of plant health threats to the natural environment and embedding mitigating actions into biodiversity strategies is of increasing importance. PHC2018/2 has created a report that provides an overview of the nature of plant health threats to Scottish plant biodiversity, the factors that expert stakeholders consider of greatest importance, and identification of the

headline areas of relevance in the recently published Scottish Biodiversity Strategy. Overall, the results of this study reinforce the importance of more active consideration of plant health threats in biodiversity strategies and related conservation activities.

PHC2020/03: Plant Health Fellowship (under review by Directorate)

Requested by: NatureScot and CPHOS

Delivered by: The James Hutton Institute

Sectors: Natural Environment

Theme: 1 and 2

[Link to Project](#)

Start Date: 01/04/2021 End Date: 31/03/2023

See highlight section 2.1 for summary

PHC2020/06: A preliminary investigation into the threat of Bronze Birch Borer (BBB - *Agrilus anxius*) for Scotland (under review by Steering Group)

Requested by: Stakeholder engagement (NatureScot and Scottish Forestry are co-funders).

Approved as priority for funding by CPHOS

Delivered by: Forest Research, National Museums Scotland (in-kind)

Sectors: Forestry, Environment

Theme: 1

Start Date: 15/02/2021 End Date: 31/03/2022

[Link to Project](#)

Summary: The Bronze Birch Borer (BBB, *Agrilus anxius*) is a major threat to birch trees. This project had co-funding from Scottish Forestry and NatureScot and undertook evidence gathering to assess the threat BBB poses to Scotland, inform risk assessment, surveillance and contingency planning, and identify key risks and knowledge gaps. The team discovered there had only been 10 recordings of *Agrilus* species in the UK. Sticky prism traps and multi-funnel traps deployed in Scotland caught no *Agrilus* species. In parallel Euphresco trials (England, Europe and north America), *Agrilus* beetles were caught in both trap types, although *Agrilus anxius* beetles were only detected in North America. No trap performed better than the other and results indicate that factors such as position and climatic conditions influence the abundance of *Agrilus* captured. The Euphresco project will further test both trap types in 2022, with and without lure, to better establish the efficacy of each trap and potential *Agrilus* species preferences. Recommendations from this project for future trapping include investigating and / or developing alternative trapping methods, especially with morphological and behavioural traits of the target species in mind, to reduce the capture of non-target species. An identified alternative trap (MULTz trap) could be tested against sticky prism and multi-funnel traps. Practical issues encountered (handling and canopy deployment) should also be addressed if new traps are developed.

PHC2021/06: A targeted analysis of the impact of insecticide withdrawals in Scotland, in the context of alternative control options (under review by Directorate)

Requested by: Action from PSG, requested by SG Policy and Pesticide Survey Team (Allan McIvor)

Delivered by: ADAS, SRUC, Forest Research

Sectors: Forestry, Horticulture, Agriculture, Environment

Theme: 1

Start Date: 30/05/2022 End Date: 31/10/2022

[Link to Project](#)

See highlight section 2.3.1 for summary

PHC2021/08: Action research to gain a deeper understanding of large-scale biosecurity risks to Scotland

Requested by: Stakeholder Engagement (and workshop with SART and OCPHOS). Approved as priority for funding by CPHOS

Delivered by: Forest Research, University of St Andrews

Sectors: Horticulture, Forestry, Natural Environment

Theme: 2

Start Date: 01/04/2022 End Date: 31/03/2023

[Link to Project](#)

Summary: PHC2021/08 has developed a systems approach, in the context of plant health biosecurity risks in the retail, infrastructure landscaping and planting in the natural environment, to facilitate further understanding of key organisations and identify general and specific leverage points at which interventions could have a significant effect on the system. It achieved this through the application of mixed method and participatory action research, including participatory workshops, an interactive exercise at Scotland's Plant Health Conference 2022, and co-design of leverage points and action points with landscape architects, a construction company manager and three garden designers. Typically, highlighted interventions include provision of plant health training and education for accreditation and in CPD, wider education and awareness and interventions in relation to practices and policies, often targeting key checklists or certification schemes. The project made recommendations that interventions should be undertaken in partnership with plant health organisations and in collaboration with key individuals in targeted organisations to ensure that cross-border solutions are co-designed and embedded within professional processes. More specific recommendations for different types of activities/businesses are made in the final report.

3.4.5 Projects in progress during the reporting period

PHC2018/17 - Assessing spread of phytophthoras in Scottish forests by recreational and harvesting activities using comparative qPCR and metabarcoding techniques

Requested by: Stakeholder Engagement during workshop at PHC conference in 2018. Approved as priority for funding by CPHOS

Delivery by: Forest Research

Sectors: Forestry, Horticulture, Environment

Theme 2

[Link to Project](#)

Start Date: 01/07/2019

End Date: 31/05/2023

Summary: The oomycete *Phytophthora ramorum* has caused substantial losses of Scottish forests in recent years due to widespread mortality of European larch trees (*Larix decidua*). Infected trees are subject to statutory felling notices in an effort to reduce sporulation potential. Nevertheless, there are concerns about the multiple pathways by which spores might be transferred to new sites. There have been assessments of soil moved by mountain biking and walking/running resulting in evidence to support the Forestry Commission's Keep-it-Clean campaign. This study will assess soil/plant material collected from commercial harvesting equipment (tyres, treads, mud guards etc.). PHC support will enable a wider range of diagnostic tests to be carried out, testing the robustness of the methods and examining the potential for multiple *Phytophthora* species to be transferred. The impact of PHC2018/17 will be to add to the evidence base underpinning public and sector-facing biosecurity campaigns and improve disease management and restrict spread of the disease.

PHC2021/05: Biosecurity for plant health: better justification of precautionary measures

Requested by: Stakeholder engagement, approved as priority for funding by CPHOS

Delivered by: Forest Research, SRUC, University of St Andrews

Sectors: Forestry, Horticulture, Agriculture, Environment

Theme: 1

Start Date: 31/03/2022 End Date: 30/04/2023

[Link to Project](#)

Summary: While it is generally agreed that ‘prevention is better than cure’ in plant health, translating such logic into precautionary actions does not always happen. Precaution can be encouraged in a variety of ways – through development of implementable actions, risk assessments, encouragement of best practice, and general appeals to adopt approaches that prevent future losses. However, this does not adequately address risky behaviour. While better information may not be sufficient to change practices, there is a weakness in our ability to justify precaution. This project seeks to address this gap by considering whether there are different approaches or additional information which might be considered. The project engaged experts and practitioners who have knowledge of existing sectoral practices in Scotland, UK and internationally, summarise existing literature and undertake a gap analysis, to generate a better understanding of the rationale for taking precautions and to improve the evidence base with which to justify taking actions. It will answer four main questions:

- What are the current barriers to adopting precautionary measures?
- How can barriers be reduced?
- What are the limitations of the current risk assessment process?
- What are the priority areas for action and further research?

PHC2021/07: Investigation into the causes of alder mortality in Scotland

Requested by: NatureScot. Approved as priority for funding by CPHOS

Delivered by: Forest Research, RBGE

Sectors: Forestry, Natural Environment

Theme: 1

Start Date: 01/04/2022 End Date: 31/04/2023

[Link to Project](#)

Summary: Originally raised by NatureScot as a plant health issue of potential concern, the health of alder trees in Scotland was initially investigated in project [PHC2019/09: Health status of alder in Scotland](#). This preliminary study found that there could be a legitimate concern over alder that may have complex causes (several biotic and abiotic stresses were noted), and the timeline of these health issues (gradual or rapid) was unclear. Further scoping and examination of the problem by established experts was recommended, leading to this project. The project conducted:

- Expert visitation of sites to seek evidence of problems with alder health, gain some understanding of possible causes, and identify the key areas for a future study should this prove warranted.
- Preliminary citizen science request inviting site-specific observations of alder health (potentially via the trained Observatree volunteer network), with analysis to identify any geographic clustering.

It will produce recommendations for further work including: refined survey methodologies for widespread application by interested organisations; identification of potential candidate sites for detailed study over time and; a discussion document on risks to existing alder of expansion of riparian woodland.

Plant Health Centre
c/o The James Hutton Institute
Invergowrie,
Dundee, DD2 5DA

Tel: +44 (0)1382 568905

Email: Info@PlantHealthCentre.scot
Website: www.planthealthcentre.scot
Twitter: [@PlantHealthScot](https://twitter.com/PlantHealthScot)



The James
Hutton
Institute



Royal
Botanic Garden
Edinburgh



Forest Research



SRUC



BioSS

University of
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