Sourcing & Establishing Healthy Trees – summary of event

The long-postponed "Sourcing Healthy Trees" event first planned for November 2020 eventually took place at the new Tree Health Centre at Yorkshire Arboretum on 13 September 2022 with some significant changes – the collaboration of the Chartered Institute of Horticulture (CIH) to create a joint event and expansion of the theme to tree establishment.

Following a welcome from Rebecca Slack (PlantNetwork), Helen Sessions (CIH) and Dr John Grimshaw (Yorkshire Arboretum), the first speaker took to the floor to introduce the main issues in tree health.

Tree health: the big issues

Dr Charles Lane, from Fera Science, spoke about his role in helping to build biosecurity awareness and measures across the horticultural industry. "Biosecurity" is a relatively recent term in the UK lexicology which has grown in importance since 2012 when ash dieback was first identified in the UK and measures to protect plant health underwent a rethink. This resulted in the Plant Biosecurity Strategy 2014, currently being refreshed for release later this year, and led to the development of the UK Risk Register, creation of the role of Chief Plant Health Officer and other steps to improve plant biosecurity in the plant supply chain across the country. The Risk Register flags potential threats to UK plants using risk ratings based on several factors and provides mitigation and control measures. It does not include pests and pathogens that are already present in the UK, many of which are listed alongside potential threats in the Pest & Disease Index.

While some pests and pathogens might enter the UK naturally, e.g., blown in on air currents, many more threats have been identified from the potential of infected plant material being introduced to the UK. While rooted plants are considered the highest risk threat, wood packaging is also high risk. Charles urged everyone to inspect pallets used to deliver plants and other materials and check for the IPPC (International Plant Protection Convention) stamp which flags country of origin, producer and importantly the treatment used on the pallet: if no stamp is apparent, seriously consider allowing the pallet on site.

Application of biosecurity measures at the garden/site level could easily reflect those applied at the international level with the gate/fence equating to an international border. This approach also provides a secondary defence as biosecurity at the national level should not be the only biosecurity mechanism and regional to local measures can restrict the spread of pests and pathogens. Delegates were also urged to ask difficult questions of contractors and suppliers regarding the sourcing of plant material.

Charles also highlighted the role of regular monitoring and inspection, including the role of citizen science projects such as Observatree in checking for symptoms of concern at the landscape level as well as within the industry. The UK Plant Health Alliance, which has developed the Plant Health Certification Scheme, has developed a standard for plant health management that is being constantly reviewed and developed to meet the needs of the industry and ensure biosecure

approaches are adopted such as the Ready to Plant assessment which provides a one-off voucher for a consignment of plants.

Identifying and minimising risks: Plant Healthy Certification Scheme

Alistair Yeomans introduced the Plant Healthy Certification Scheme. The Scheme is governed by the UK Plant Health Alliance, which was established in 2018 and includes 20 government, trade and third sector organisations. It is now acknowledged that the movement of live plants is one of the highest risk pathways for plant pests to be moved to a new area. Over 80% of plants sold in the UK are imported and threats also exist when moving plants within GB, as such the scheme covers the movement of all plants along industry supply chains. The aim is to prevent future pest and disease introductions, such as *Phytophthora ramorum,* and the focus is on all high risk plant pest threats, e.g. *Xylella fastidiosa* and three species of long-horn beetle. Plant Healthy has two key aspects: the Plant Health Management Standard, a set of requirements aimed at improving plant biosecurity; and the certification scheme, which provides a formal pathway for businesses and other applicants to demonstrate compliance with the Standard. There is a Certification Scheme Manual which provides guidance on meeting the requirements and explains the audit process. Once certified business and organisations are listed on the Plant Healthy online directory (www.planthealthy.org.uk). Sourcing plants from certified businesses provides a higher level of assurance as the threats have been robustly assessed and minimised.

Sourcing and assessing incoming trees workshop

Kirsty Wright, Plant Reception Coordinator for the Royal Horticultural Society, informed a short workshop that asked delegates to consider the biosecurity approaches they are currently utilising and the standard they would like to achieve for sourcing and then assessing incoming trees. As an introduction, Kirsty asked delegate to consider how material is currently sourced such as the use of reputable suppliers, asking questions of suppliers on origin of plant material and the policies they have in place to assess and monitor plant health, and the reassurance offered by certification schemes. Following a breakout session, Kirsty then looked at assessing incoming plant material – what to do on arrival from inspection, checking documents to isolation (reception or quarantine), hygiene practices and appropriate training (to know what to monitor). The use of a plant health checklist to record inspections was highlighted as was the need to inspect regularly (inspect, inspect, inspect!). Contracts with suppliers to ensure adequate reporting is in place if a problem is identified, correct and consistent labelling, adequate area for isolating new material including isolating growing media, water supply, reduced foot traffic and containment of flying insects as well as facilities for ensuring good plant health such as tree lines and irrigation. Speak with and discuss requirements with plant suppliers.

In small groups, delegates discussed what practices are currently being employed at their sites. Key issues discussed included:

- A demand for rare plants which can be a problem sourcing so while cautious, there are still potential gaps in biosecurity measures whether sourcing as seed or as young/mature plants;
- Outsourcing of work (e.g. new projects) to contractors who might not be aware of the need for biosecurity measures or appropriate sourcing e.g. might still bring in lavender from Italy;
- Barriers to appropriate adoption of biosecurity measures include no space for isolating incoming materials; lack of resources (staff time or funding especially for projects of set duration which have not included on-going maintenance or biosecurity costs); expectations of immediate aesthetic leading to shorter quarantine period, sourcing of more mature plants or importing of

more plant material; lack of knowledge of what to look for on incoming plant material or no monitoring system in place demonstrating a need for more training and awareness particularly in training programmes for apprentices and students.

- Many sites using known /local suppliers whenever possible, using bare-rooted stock, sourcing from UK and using Plant Healthy certified suppliers as well as isolating new material, providing training to staff to ensure effective monitoring, and using advisory services.
- It was acknowledged that hygiene across sites should also be improved to prevent development of problems which could affect vigour of plants and hence make more susceptible to new pests and pathogens.
- Communicating the need and importance for biosecurity to non-gardeners was also highlighted as an issue – whether colleagues or visitors.

Tree health at Yorkshire Arboretum

Dr John Grimshaw, Director of Yorkshire Arboretum, provided an introduction to the Yorkshire Arboretum, home to over 7,000 diverse specimens, some from the 18th century parkland and introductions from historical plant collection expeditions but also many from modern collections and others ex situ conservation of endangered species. Like all gardens and plant collections, the Arboretum has a good collection of pests and diseases also! Combined with excellent plant records and a monitoring programme, many of the pest and disease issues have been well-studied in the Arboretum, which now provides training as well as continual involvement in programmes such as Observatree and ISPN. Highlighting a few of the tree health issues currently identified and monitored in the Arboretum, John also mentioned more general health issues that can impact on the health and vigour of the collection such as right tree, right place, impact of a changing climate (and limitations of current climate), good planting practice and the need for diversity (genetic and species). Sourcing tree material can be problematic as many nurseries grow a limited palette, so experimenting with new genera can be difficult. Yet, with climate change exerting noticeable impacts on plant collections across the UK, there is a need to grow more alternative species: John highlighted the Hemery and Simblet (in The New Sylva, 2021) argument of planting woodlands with a third local native trees, a third of native trees from southern climes and one third alternative species.

Arboretum tour

A walking tour of the Arboretum, led by Charles Lane and John Grimshaw, considered the following plant health issues:

- Horse Chestnut Leaf Miner (Fig 1(A))– first reported in the Balkans over 20 years ago, the leaf miner affects the vigour of the tree over time and make it more susceptible to other pests and pathogens such horse chestnut bleeding canker.
- Great Spruce Bark Beetle (Fig 1(B))– indicated by resin on the main stem, with evidence of beetle emergence tubes in the resin, and dieback in the crown. A biocontrol is available and is being monitored in the Arboretum, which hold a National Collection of *Picea*, to understand its efficacy.
- Pear Rust (*Gymnosporangium*) – causes spot on the leaves of pear trees and requires the presence of juniper to complete the life cycle.
- *Neonectria* (Fig 1(C))– an opportunistic fungal pathogen of *Abies* and *Picea* which causes browning of needles and is a particular problem in Christmas tree production.
- Non-native trees often struggle in collections as environmental conditions are not ideal for their development e.g. compare growth of *Liriodendron tulipifera* trees in US compared to UK.

- An interesting specimen is an Asian ash (*Fraxinus sieboldiana*) graft on to *Fraxinus excelsior* rootstock (Fig 1(D)): the rootstock is exhibiting ash die-back but the graft is not, indicating a level of tolerance to the pathogen.

Figure 1: (A) Horse chestnut leaf miner; (B) Symptoms of great spruce bark beetle in crown dieback and resin formation on trunk; (C) symptoms of Neonectria causing browning of needles; (D) grafted ash on Fraxinus excelsior rootstock indicating tolerance to ash dieback.

Grey squirrel control and management

Dr Julie Lane, from APHA's National Wildlife Management Centre, spoke about ongoing research to control grey squirrels across the UK. With almost 3 million grey squirrels in the UK, they are expected to cost £1bn in the next 30-40 years in damage to trees and other wildlife. Existing control measures are not effective so the UK Squirrel Accord, a group of organisations looking at alternative control measures, have commissioned research into a fertility drug. Research has focused on an immunocontraceptive vaccine which has been demonstrated to be highly effective as an injection in most mammal species but this mode of delivery is not appropriate for squirrel control: the vaccine must be available as an oral contraceptive. Using Sporomex technology, the vaccine has been added to pollen grains, mixed with hazelnut paste and will soon be trailled in two types of bait system which will be deployed in grey squirrel-only areas and in red and grey squirrel mixed zones. Combined with traditional trapping and control measures, it is expected that grey squirrel populations might be reduced by as much as 90% in ten years.

Selecting healthy trees for a changing climate

Simon Toomer, Curator of Living Collections at the Royal Botanic Gardens Kew, introduced the importance of future-proofing the tree landscape as the changing climate will have a huge impact on tree health and survival. A need for a diverse landscape that will remain healthy after the full impacts of climate change are felt, with concurrent pest and pathogen pressures, is a complicated consideration. Conifers across the UK are already experiencing problems, often exacerbated by trees being grown on poorer soils compared to other plants and crops.

RBG Kew has an excellent but aging tree collection, poor soils, increasing temperatures and declining rainfall (particularly seen this year), varying topography (if include Wakehurst as well) and the need to maintain a UNESCO World Heritage Site. Planning involves understanding current site and constraints, future models, likely impacts on the collection based on the future models and hence a "what happens if we do nothing?" consideration. This then develops into evaluating what species should be replanted and what can be added for resilience before developing planting plans and schedules. This has started this year with careful monitoring of the impact of a dry, hot summer in 2022. Comparison with observations from other gardens across the UK will be useful to set a baseline for the observations. Use of Köppen-Geiger climate zones will help to develop future planting plans. The Climate Change Alliance of Botanic Gardens audit is one such tool developed to help botanic gardens plan for a changing climate and is being used increasingly by gardens around the world. BGCI are set to relaunch an updated climate risk assessment tool this month also. Future planning is restricted by the problems of sourcing rarer tree species.

Basic elements of tree establishment

Mauro Lanfranchi, Tree Health Officer with the Forestry Commission, highlighted the four key aspects of successful tree planting – tree ecophysiology, plant quality, planting practice and soil health. It is not uncommon for tree mortality in the first year of planting to be as high as 30-50%: to avoid this, the four aspects should be considered. Choosing trees more suited for the conditions is important – suitable for the microclimate and the soil conditions (including tolerance of drought or water-logging) as well as other factors such as proximity of pathways/roads, surface sealing etc.. Some species are sensitive to transplantation while others, notably willow, are highly tolerant of root disturbance. Most trees show better survival if planted in November or December compared to later in the tree planting season (with the exception of some species requiring later planting).

A healthy landscape requires high quality nursery stock. Look for good root systems with healthy shoots/leaves. If visiting the nursery, look at the spacing of the stock as if too dense, plants will be less healthy. Avoid circling roots which retard growth and impact plant vigour: look for signs of regular repotting and/or use of air or light pots to prune roots. Transportation from nursery to site is also important as can result in damage to the plant.

When planting, it is important to consider the pore spaces in the soil so do not compact the soil. Prune any circling roots; do not plant too low; plant no deeper than the rootball but in a hole at least two or three times the width of the rootball; gradually back fill but do not compact the soil; water immediately and regularly thereafter for at least the fiorst year; support the lower part of the stem and remove support after about two years.

Aftercare is needed after planting and needs to be planned in a maintenance programme. Formative pruning is useful to establish the required shape. Mulching is useful to support the rhizosphere and aiding post-planting watering: the mulch should extend to the width of the canopy. Watering is required, particularly if the roots have been pruned and the watering regime should be dictated by the soil type.