

Damaris Horan Prize Fellowship: October 1 – November 28, 2012

Plant Health in the Southwest of England

I. Overview

Pests and diseases have long impacted plants in the United Kingdom. Plant caretakers have dealt with problems such as honey fungus for hundreds of years. However, due to the increasing ease of trade in the EU and across the world and the changing climate, new pests and disease have begun to enter into and thrive in the UK (FERA 2013).

Unlike their native counterparts, native species have built up no resistance to these exotic pests and diseases. So, when an exotic pest or disease arrives, it can have devastating effects. For example, Dutch elm disease hit the UK in full force around 1967, when it was thought to be brought in on a shipment of logs from North America (Webber 2013). Within a number of years, 25 million elm trees had died and very few mature elms were left in Britain (Webber 2013). Today, the UK is faced with a number of exotic, lethal pests and diseases, not limited to Oak Processionary Moth, Asian Longhorn Beetle, and Phytophthora (FERA 2013).

The southwest's gardens in particular are at great risk to these invasive pests and diseases. Devon and Cornwall have countless rare and exotic species and first time introductions that make their gardens so special. Additionally, the year-long growing season due to a warm climate and lots of rain makes for unabated plant growth. All of these factors combine to make the southwest the ideal place for exotic pests and diseases to thrive and very vulnerable to their impacts.

Most recently, the gardens of Devon and Cornwall have suffered from the spread of *Phytophthora ramorum*, a pathogen that weakens and kills a variety of plants, including rhododendron, camellias, and Japanese larch (FERA 2013, Figure 1). It is particularly problematic because it currently has over 100 host plants and that number continues to grow. *P. ramorum* infects important timber species, prize species' in plant collections, and

even native trees, such as beech. The pathogen spreads easily through water and the humid air of Cornish gardens and is incredibly difficult to keep in check once established (FERA 2013). There is no “cure” for *P. ramorum*. The only recommendations once it is found is to remove the infected plant immediately and destroy it, otherwise it will continue to spread through the garden. The area then cannot be replanted with any potential host species for several years after the infected plant is removed.

Phytophthora is not alone in its difficulty to eradicate. All of the quarantine listed pests and diseases in the UK today are nearly impossible to get rid of once they are established and their impacts on gardens and woodlands are devastating. Damage from pests and disease results in not just the loss of rare plant species, but also large economic losses. Every year pests and disease infect commercial timber, woodlands and wetlands that provide key ecosystem services, critical commercial crops, and gardens enjoyed by the public. The United States alone estimates that it is cost over a billion dollars a year by the damage caused by invasive pests, diseases, and plants.

Given the grave damage that non-native pests and diseases may inflict and their difficulty to eradicate, it is essential that biosecurity measures are put in place by land managers to ensure that they are doing all they can to prevent their establishment. My goals for the 8 weeks I spent in the Southwest were to determine what was already known about biosecurity, what measures had been put in place, and how could I create tools that gardeners could use to improve their existing biosecurity.

II. Assessing Gardeners’ Implementation and Understanding of Biosecurity

I began my time interviewing head gardeners at the National Trust’s properties throughout the southwest. I wanted to find what gardeners were already doing and how much they knew about biosecurity in general. Biosecurity is a relatively new concern for gardeners and I wanted to find the knowledge gaps. I asked in general about what types of pests and diseases they have encountered in the past, both native and non-native and how they have dealt with them. I asked if they consulted anyone about the pests and diseases they encountered and the help they received. I also asked how concerned they were about exotic pests and disease entering their gardens.

I got very varied responses, but in general I found that all gardeners had a good base knowledge of biosecurity. I also found that while everyone seems to know what good practice is, it is rare that anyone actually implemented more than one or two biosecurity measures, citing lack of funding or staff time as a major factor as to why not. This is not true, however, of gardens that had encountered *P. ramorum*. In general, the gardens who had had Phytophthora or another quarantine pest or disease were much more rigorous with their biosecurity. These places tended to have better quarantine facilities and more conscientious staff. When I asked gardeners at these places if their biosecurity measures had always been in place the answer was always no - the measures were put in place in reaction to their infestation/infection.

I went on to ask a lot of questions about the help they felt was available to them should they find a suspect pest or disease. Everyone I spoke to said that the plant health advisor (Ian Wright) would most likely be their first point of contact should they suspect something in their garden. While everyone I spoke to said he was an excellent resource, they all expressed the wish to have additional support, since he was only doing plant health two days a week and was spread across the whole of the UK. A few said they might call a government agency, such as DEFRA, but most seemed unenthusiastic about the prospect. However, once again those who had dealt with quarantine pest or diseases in their gardens spoke of the regular inspections they received from FERA and the aid they had gotten from the NT Plant Health Advisor. In fact, a number of these gardens were already having regular nursery inspections by FERA, and the FERA inspector was the person who first spotted the quarantine disease (in all cases it was Phytophthora).

The final thing I asked was what tools did gardeners already use and like. I asked a lot about how often they used a computer vs. in-print books or pamphlets. Did they e-mail a lot or were they always out in the garden. Did they have time to read plant health updates in detail, or would they prefer meetings throughout the year to update him/her on the latest plant health and disease concerns. Not surprisingly I found that while head gardeners did spend a lot more time in front of a computer than they would have liked, many still preferred print materials that were streamlined. They preferred things that were easy to read and understand that could easily be shared with staff and volunteers. Everyone

expressed the feeling that they wished they could spend more time actually tending to the health of their plants, whereas currently they are asked to do a lot of paperwork, etc.

III. Tools I Created

I gathered a lot from my visits, some positive things and some areas for improvement. I think what was most striking to me was that no one seemed to know where to look to identify a quarantine pest or disease and what procedure to follow should they suspect something in their garden. Everyone had a different idea of who to call and what to do if they found suspect insects, fungi, or pathogens in their garden. In response to this, I created a flow chart of exactly what one should do when considering something suspect (Figure 2). It outlines the process from regular monitoring of garden health through identification, contacting appropriate authorities, creating a plan to deal with the pest or disease, and carrying through with the plan. It is a simple side of A4 paper that can be easily hung in an office or in a break room and shared with other staff and volunteers.

I next created a risk assessment flow chart (Figure 3). Gardeners are currently thinking about biosecurity as a reactionary measure to the infestation of their gardens, rather than as precautionary. The risk assessment is meant to be an easy way to get gardeners to begin thinking about the ways pests and disease may enter their garden and what effect they could potentially have. The tool should help gardeners identify potential paths of quarantine pests and disease into their garden and what areas of the garden are most vulnerable so that these can be given special attention. I also have a version that is adapted for countryside and woodland managers (Figure 4).

Finally, I created standards of evaluation for a garden's biosecurity performance. This document is meant to be printed on two sides of an A4 paper so it can be brought into the garden to perform the assessment (Figure 5). I based the document off the "Environmental Standards for Parks and Gardens", so that gardeners were already somewhat familiar with the terminology and format of Bronze, Silver, and Gold. The standards are meant to fit into the CPI process and provide a baseline standard of performance for each garden. It's not meant to "name and shame" gardeners and gardens, but rather allows those performing the CPI assessment of a property to establish a measureable baseline so that future targets can

be set and easily measured. I also have created a version for countryside and woodland managers (Figure 6).

These three documents are meant to work together to help gardeners prevent the infestation of quarantine pests and diseases in their gardens now, set goals to further increase their biosecurity in the future, and deal with any infestations that might occur now or in the future in a quick and efficient manner.

IV. Suggestions for the Future

Looking forward, I think there are many improvements that can still be made, but a strong foundation is already set. Although I heard mixed reviews of the helpfulness of the CPI process, I think it has a lot of potential. Currently, it seems that gardeners are constantly dropping and picking up projects with what the trust values in that year. Since visitor experience is the current theme, I've talked to a lot of gardeners who have put in place really great projects in response to this, but it also seems other things fall to the wayside. It is inevitable, as there are only ever so many hours in the day, but I think it is possible to partially avoid this.

I believe the Environmental Standards for Parks and Gardens is a great and underused tool by gardeners. If it was updated and adjusted to fit the format of having a numerical value for each standard, similar to the biosecurity measures, it could be used to set a baseline for all gardens. It would make it easy for gardens to be assessed in a way that is understood by both gardeners and property managers. It would make what is expected of all gardens very clear and would ensure that gardeners prioritized what is most important to their garden's health and well-being. I think Whales has already done this to a minor extent, where it has a document of all of the gardens in the region and where they are in terms of meeting the Environmental Standards. They are the only region to have every garden up to at least bronze and I think their success is in a large part to their emphasis on meeting the Environmental Standards and sharing their successes around their region.

I think if the Environmental Standards for Parks and Gardens was put in a measureable format and used in the CPI process, it would ensure that gardens across the UK were

meeting a set of basic standards. The standards could be edited and amended as needed and can be used for goal-setting in the CPI process.

Works Cited

The Food and Environment Research Agency (FERA). 2013. Plant Health.

<http://www.fera.defra.gov.uk/plants/plantHealth/>

Webber, J. 2013. Forestry Commission: Dutch elm disease in Britain.

<http://www.forestry.gov.uk/fr/hcou-4u4jcl>

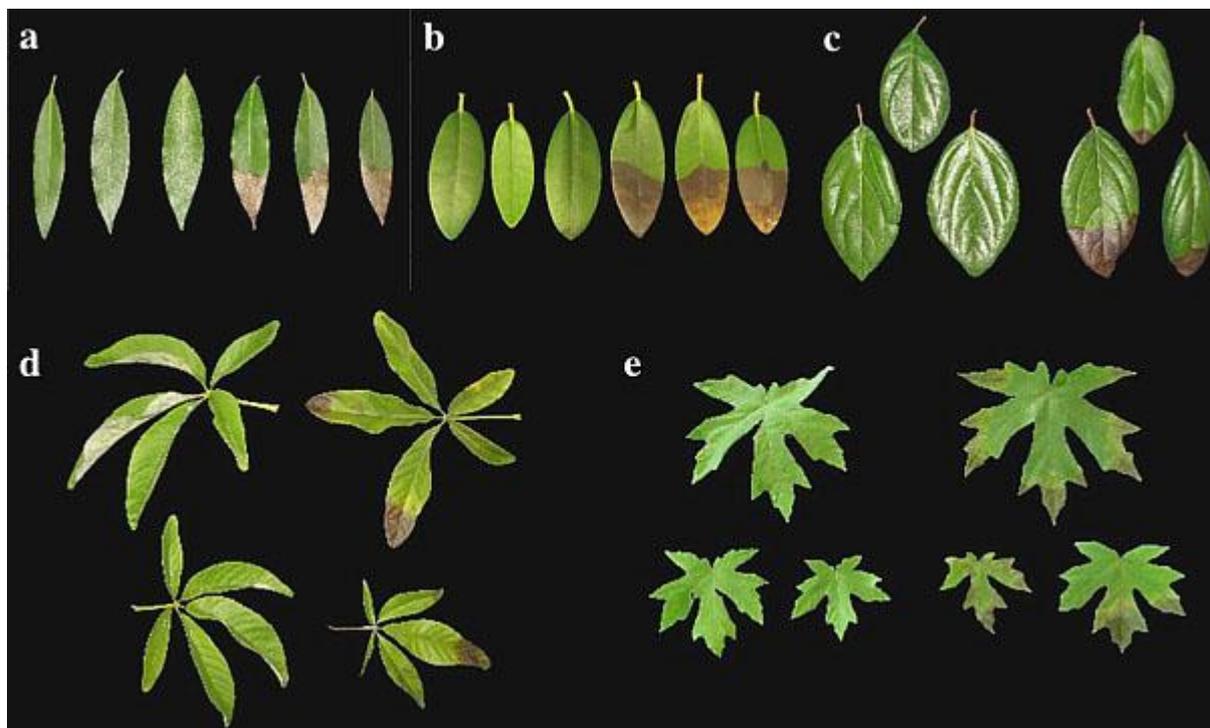
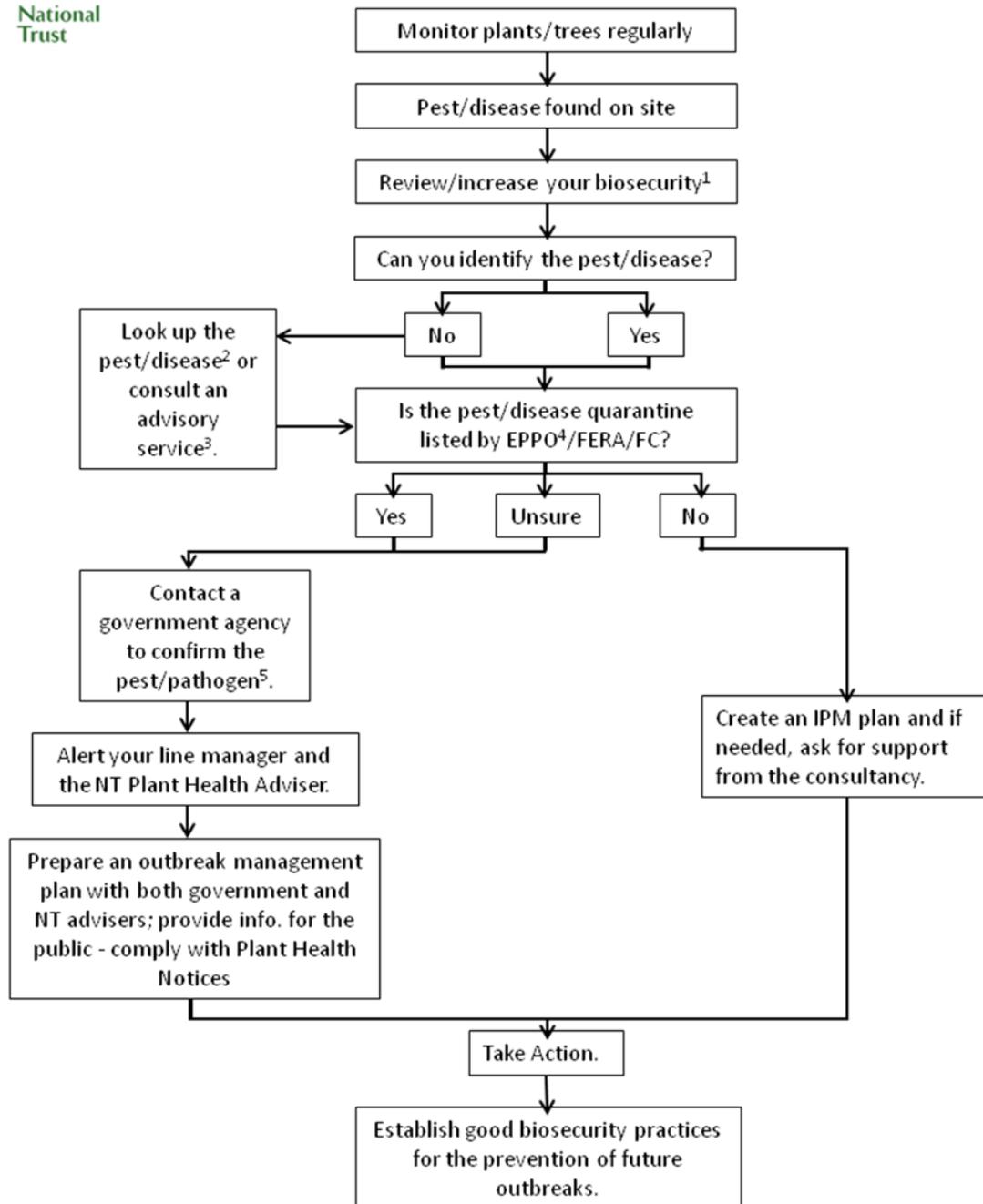


Figure 1. Leaves inoculated with *Phytophthora ramorum* (right) and uninoculated control leaves (left) of (a) California bay laurel, (b) rhododendron, (c) viburnum, (d) California buckeye, and (e) bigleaf maple. Image from: Plant Management Network International. 2013. Plant Health. <http://www.plantmanagementnetwork.org/elements/view.aspx?id=3426>.

Plant pest and disease flow chart



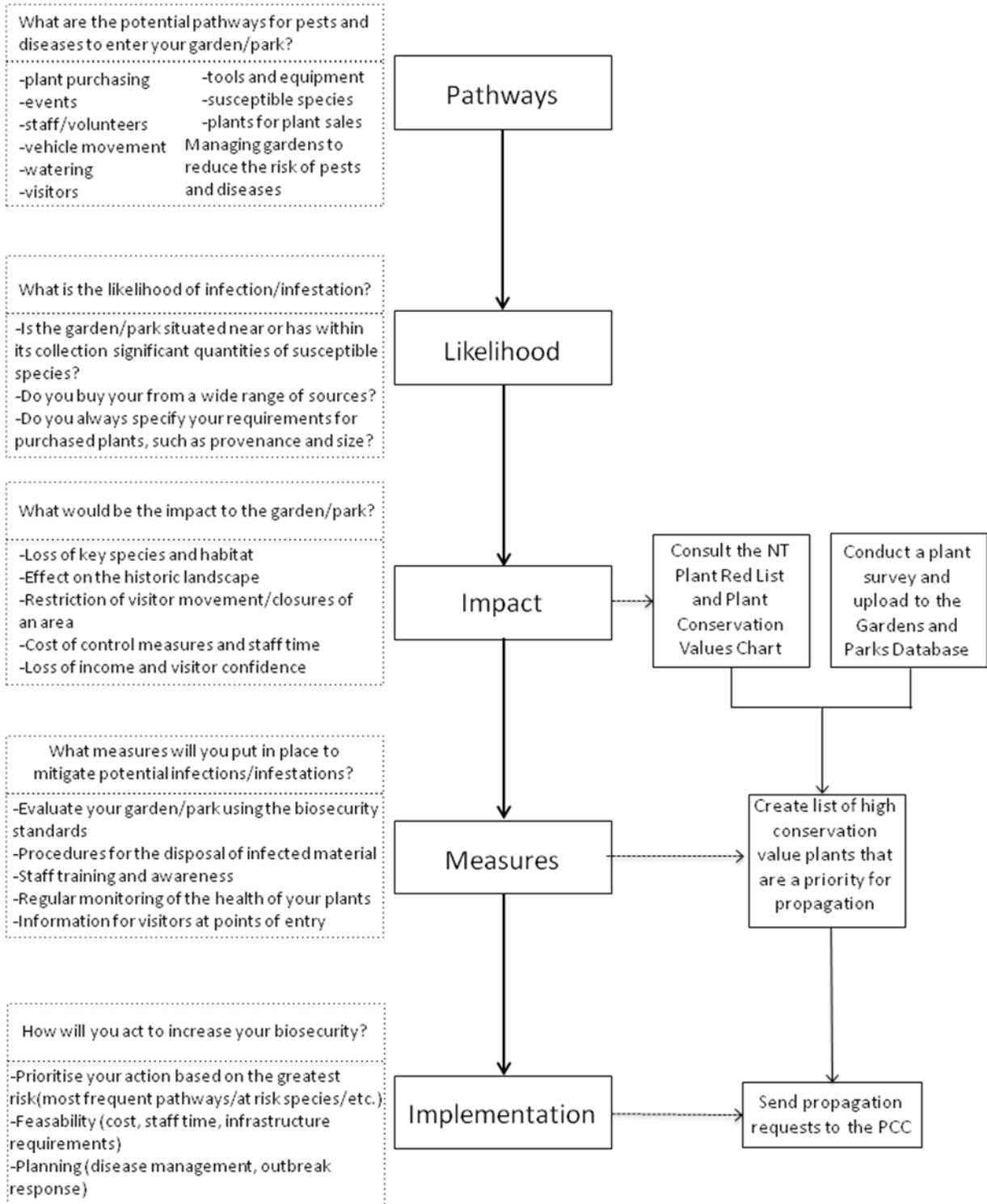
1. Plant Health Page on Intranet
 2. Search FERA's plant health pages (fera.defra.gov.uk/plants/publications/index.cfm) or problems by plant on RHS's site (<http://apps.rhs.org.uk/advicestem>)
 3. Consult a government advisory service (see #5) or RHS' advisory services.
 4. EPPO A1 List - epo.int/QUARANTINE/listA1
 5. Forestry Commission Plant Health Service Helpline T: 0131 314 6214 E: plant.health@forestry.gov.uk
 Forest Services T: 289 052 4480 E: customer.forests@ardni.gov.uk
 FERA T: 0190 446 5625 E: planthealth.info@fera.gsi.gov.uk
 DARD Helpline T: 0300 200 7852 E: dardhelpline@ardni.gov.uk
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Figure 2. Plant Pest and Disease Flow Chart.



Plant Health Risk Assessment Flow Chart

This flow chart will help you assess and mitigate the risk to your garden and plant collection from pests and diseases.



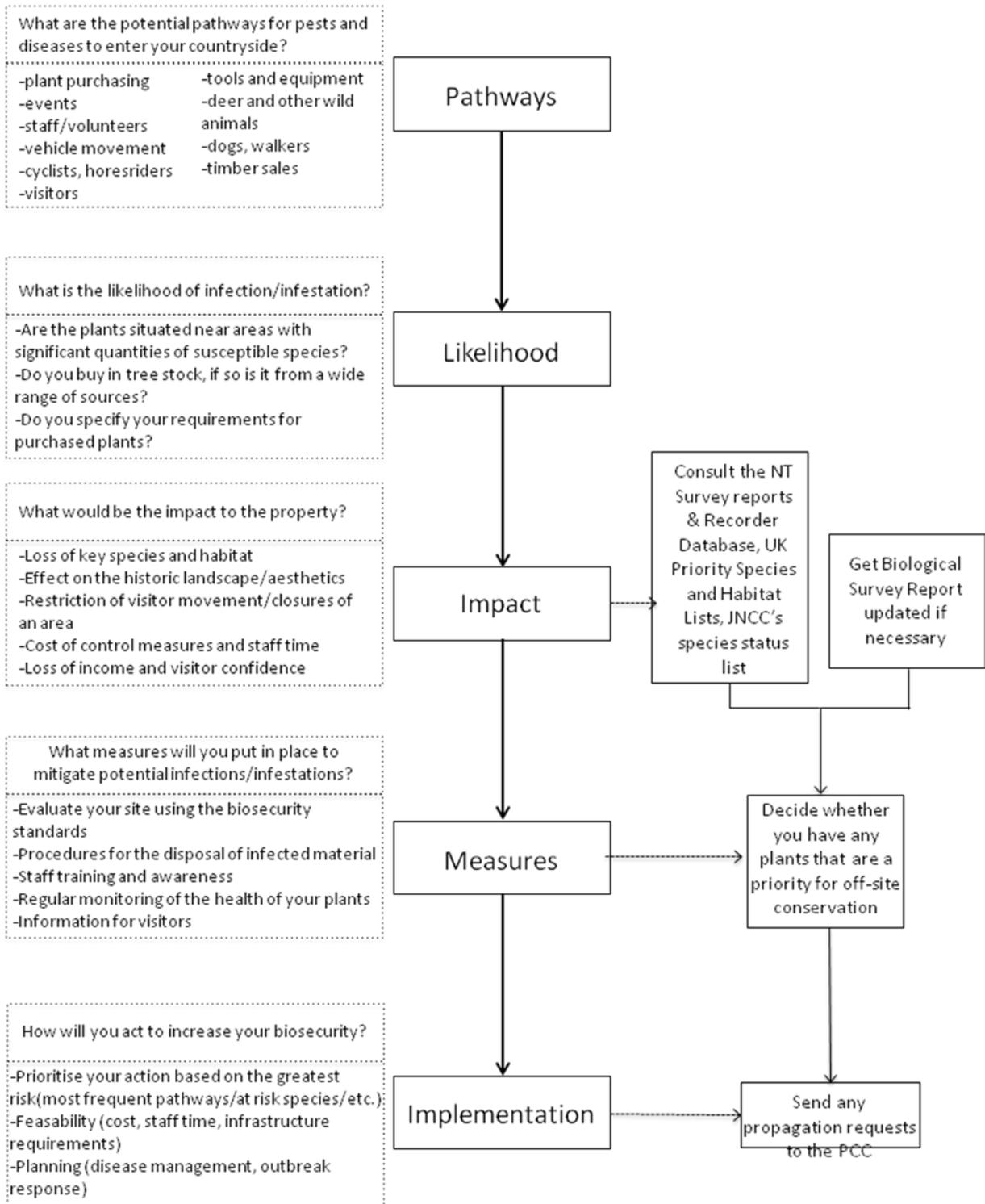
Page Author: Ian Wright - Developed by: Meghan Blumstein - Date: 29/11/2012

Figure 3. Plant Health Risk Assessment Flow Chart (for parks and gardens).



Plant Health Risk Assessment Flow Chart

This flow chart will help you assess and mitigate the risk to your woodland/countryside and plant collection from pests and diseases.



Page Author: Ian Wright - Developed by: Meghan Blumstein - Date: 29/11/2012

Figure 4. Plant Health Risk Assessment (Woodlands and Countryside).



National Trust

Biosecurity Standards: Parks and Gardens

Record the score for your garden/park in the boxes to the right of each standard, which represents the progress you have made on each of the biosecurity guidelines. Score bronze out of 5, silver out of 10, Gold out of 20. There is an electronic version of this in excel format available.

BRONZE

Score 0-5

Husbandry	
<ul style="list-style-type: none"> •Plants are maintained at optimal health - a healthy plant is much less likely to succumb to disease. •Good airflow through plants, especially those at higher risk (ie. woody plants). •Biological controls are used wherever possible and chemicals are only used as a last resort. •Minimise plant contact with the ground via mulching and pruning. •Keep weeds under control. •Cut plants back from paths. •Keep all paths clear of leaf litter and debris. 	
Hygiene	
<ul style="list-style-type: none"> •Staff and volunteers clean boots daily or leave boots and other PPE on site. •Clean boots and hands before entering nursery or plant reception areas. •Wash and disinfect all tools on a regular basis, especially when travelling to and from infected sites. •Clean all equipment before and after sharing with another property. •Inform the public about plant health and what they can do. 	
Water Management	
<ul style="list-style-type: none"> •Filter all rainwater (UV light, O-Zone, or a sand filter), alternatively use a borehole or mains water. •Do not overwater. •Treat recycled water prior to reuse. •Do not use hosepipes from infected areas in uninfected areas. 	
Staff Training	
<ul style="list-style-type: none"> •Incorporate plant health when training a new member of staff or volunteer. •Regularly read and share updates posted on the plant health intranet page. 	
Plant Purchasing	
<ul style="list-style-type: none"> •Get to know your supplier and feel comfortable specifying what plants you would like, their provenance, when they are required, and how you want them grown. •Ask where purchased plants have been throughout their production. •Wherever possible, purchase plants sourced and grown in the UK. •Provide a plant creche for visitors who purchase plants to avoid them being carried through the garden. 	
Incoming Plants and Quarantine	
<ul style="list-style-type: none"> •Hold plants back from planting for 6-8 weeks if possible, or longer if required. If quarantine facilities are not available for a specific plant (ie. bare root), monitor closely after planting. •Use "hubs" or properties who have quarantine facilities for very high risk plants. •Plant holding area is separated from the rest of the garden/nursery and access is restricted. •Carefully inspect plants on delivery to ensure they are free from pests and diseases. Only accept plants if they are healthy. •Ensure all plants have the correct documentation where required (ie. phytosanitary certificate or plant passports). Keep accurate records of all new plants on the Gardens and Parks Plant Database. 	
Waste Management	
<ul style="list-style-type: none"> •Dispose of any suspect material safely. •Compost is produced on a solid (such as concrete) base with runoff collection and disposal facilities. •Compost is covered. •Compost is turned at regular intervals to sustain high temperatures that will kill pathogens. 	

Bronze continued on next page

BRONZE (cont.)

Score 0-5

Monitoring and Record Keeping	
•Have undertaken risk assessment of garden/park.	
•Regularly inspect the health of your plants.	
•Follow "Plant pest and disease flow chart" if pest or disease is suspected.	
•Complete plant survey and upload to the Garden and Parks Database.	
•Identify and verify significant plant specimens using the Conservation Plant Values chart.	
•Establish a conservation program with the PCC to safeguard all valuable plants.	
•Familiarise yourself with the pests and disease that may impact on your plant collection.	
•Keep a record of any pest and disease outbreaks in your garden/park.	

SILVER

Score 0-10

Husbandry	
•Pathways are well made (graveled or paved).	
•Pathways are kept clear of mud and have a satisfactory drainage system.	
•Use companion planting - grow sacrificial plants that the pest prefers or that provides a habitat for predators.	
Hygiene	
•Ensure contractors are aware of their biosecurity responsibilities, such as cleaning boots and tools before and after working on site.	
Water Management	
•Control overhead watering to minimise diseases spread by water splash.	
Staff Training	
•Pass on plant health knowledge to staff across all departments on the property.	
•Keep up to date with plant health alerts (ie. conferences, lectures, online)	
Plant Purchasing	
•Specify that plants are not sprayed by anything that might mask a problem, like a fungicide.	
Incoming Plants and Purchasing	
•There is a quarantine area in a protected environment (ie. polytunnel), preventing pest and disease passage.	
•Establish good airflow through your quarantine area.	
•Keep plant delivery vehicles off the premises as far as possible and make sure they deliver onto a hard surface, clear of mud and puddles.	
Monitoring and Record Keeping	
•Monitor pest and disease levels regularly (ie. sticky traps).	
Waste Management	
•Make provision to hot compost & achieve Env. Standards for Parks and Gardens silver standard for composting.	

GOLD

Score 0-20

Husbandry	
•Develop the capacity/skills for in-house/local propagation.	
Hygiene	
•Install rumble strips at entrance and exit drives to shake mud off vehicle wheels.	
Plant Purchasing	
•Plan for new plantings far enough ahead to ensure the majority of propagation work can be sourced as locally as possible and plants can be contract grown to your specifications.	
•Avoid purchasing mature, semi-mature, and larger plants, which are more difficult to inspect.	
Waste Management	
•Meet Env. Standards for Parks and Gardens gold standard for composting.	

Figure 5. Biosecurity Standards: Parks and Gardens.



National Trust

Biosecurity Standards: Woodlands and Countryside

Record the score for your woodland/countryside in the boxes to the right of each standard, which represents the progress you have made on each of the biosecurity guidelines. Score bronze out of 5, silver out of 10, Gold out of 20. There is an electronic version of this in excel format available.

BRONZE

Score 0-5

Husbandry	
•Protect plant root systems from unnecessary stresses – a healthy plant is much less likely to succumb to disease.	
•Avoid use of herbicides and fertilizers around trees and shrubs to prevent damage to mycorrhizal fungi.	
•Site stock feeders away from tree root systems.	
•Do not plough under trees, dig drainage ditches, etc.	
•Keep veterans and other notable trees free of competition from younger growth.	
Hygiene	
•Staff and volunteers clean boots daily or leave boots and other PPE on site.	
•Clean boots and hands before entering nursery or plant reception areas.	
•Wash and disinfect all tools on a regular basis, especially when travelling to and from infected sites.	
•Clean all equipment before and after sharing with another property.	
•Inform the public about plant health and what they can do.	
Staff Training	
•Incorporate plant health when training a new member of staff or volunteer.	
•Regularly read and share updates posted on the plant health intranet page.	
Plant Purchasing	
•Restock using natural regeneration wherever possible.	
•Get to know your supplier and feel comfortable specifying what plants you would like, their provenance, when they are required, and how you want them grown.	
•Ask where purchased plants have been throughout their production.	
•Wherever possible, purchase plants sourced and grown in the UK.	
Incoming Plants and Quarantine	
•Hold plants back from planting for 6-8 weeks if possible, or longer if required. If quarantine facilities are not available for a specific plant (ie. bare root), monitor closely after planting.	
•Carefully inspect plants on delivery to ensure they are free from pests and diseases. Only accept plants if they are healthy.	
•Ensure all plants have the correct documentation where required (ie. phytosanitary certificate or plant passports).	
Waste Management	
•Dispose of any suspect material safely.	
•Compost is produced on a solid (such as concrete) base with runoff collection and disposal facilities.	
•Compost is covered.	
•Compost is turned at regular intervals to sustain high temperatures that will kill pathogens.	

Bronze continued on next page

BRONZE (cont.)

Score 0-5

Monitoring and Record Keeping	
•Have undertaken risk assessment of garden/park.	
•Regularly inspect the health of your plants.	
•Follow "Plant pest and disease flow chart" if pest or disease is suspected.	
•Be aware of any particularly rare or notable species on your site – consult Biological Survey reports, UK Priority Species Lists, JNCC Species Status data.	
•Consider whether an updated general Biological Survey or specialist biological surveys are desirable (consult your Wildlife & Countryside Adviser)	
•Establish a conservation program with the PCC if necessary to preserve rare genetic resources.	
•Identify whether you have any plants that are priorities for off-site conservation.	
•Familiarise yourself with the pests and disease that may impact on your plant collection.	
•Keep a record of any pest and disease outbreaks on your property.	

SILVER

Score 0-10

Hygiene	
•Ensure contractors are aware of their biosecurity responsibilities, such as cleaning boots and tools before and after working on site.	
Staff Training	
•Pass on plant health knowledge to staff across all departments on the property.	
•Keep up to date with plant health alerts (ie. conferences, lectures, online)	
Plant Purchasing	
•Plan for new planting far enough ahead to ensure the majority of propagation work can be sourced as locally as possible and plants can be contract grown to your specifications.	
•Avoid purchasing mature, semi-mature, and larger plants, which are more difficult to inspect.	
•Ensure and specify that plants are not sprayed by anything that might mask a potential problem, like a fungicide.	
Incoming Plants and Purchasing	
•Keep plant delivery vehicles off the premises as far as possible and make sure they deliver onto a hard surface, clear of mud and puddles.	

GOLD

Score 0-20

Husbandry	
•Develop the capacity/skills for in-house/local propagation.	
Plant Purchasing	
•Review site management objectives, targets and working practices to ascertain whether buying in stock can be avoided.	

Total Bronze:

Total Silver:

Total Gold:

Overall Total:

Figure 6. Biosecurity Standards: Woodlands and Countryside.