

Parks and Gardens

- Biosecurity Best Practice Protocols



The Food and Environment
Research Agency



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INTRODUCTION

1. In the last few years, a number of plant pests and diseases have been found for the first time in the United Kingdom and have caused significant damage to either our native flora or to commercial crops. These include, for example, *Phytophthora ramorum* and *Phytophthora kernoviae* affecting trees, heathland plants and heritage gardens; oak processionary moth (*Thaumetopoea processionea*) with its associated threat to human health; and horse chestnut bacterial canker (*Pseudomonas syringae* pv. *aesculi*).
2. These threats have increased with the globalisation of trade generally with a marked increase in the volume and diversity of plants and plant products entering the UK, and with climate change with warmer winters and increasing summer storms.
3. International and national legislative controls exist to reduce the risk of plant pests and diseases moving around the World. However, these controls cannot reduce the risk to zero.
4. Therefore, it is vital that everyone with an interest in our native flora or a stake in commercial crops or gardens take some simple steps themselves to further reduce the risk of introducing or spreading plant pests and diseases in the country.
5. These Best Practice Protocols provide helpful advice on the 'biosecurity' measures which can help to protect parks and gardens from pest and disease attack. Although they have been written primarily for the control of two species of *Phytophthora*, *P. ramorum* and *P. kernoviae*, the measures are intended to offer protection generically across all plant pests and diseases. A complementary set of protocols have been produced for nurseries, retailers and landscapers.
6. The protocols were drafted by a small team of plant scientists at The Food and Environment Research Agency and a Working Group of professional stakeholders. You are invited to have a read, share them with your staff and pick out and implement any measures which you consider would help your business.

Dr David Slawson
The Food and Environment Research Agency

Date May 2012

P&G1 SOURCING PLANTS

AIM:

- To reduce the risk of introducing *Phytophthora* into a park or garden on purchased or donated plants

WHY?

- Bought-in (purchased) or brought-in (e.g. donated) plants are the most important way in which *Phytophthora* species (and many other pests and diseases) are introduced inadvertently into a park or garden
- Good sourcing practices will significantly reduce the risk of introduction

HOW?

- Ensure that you are aware of the plant subjects that are most susceptible to *Phytophthora* species, particularly the notifiable pathogens *Phytophthora ramorum* and *P. kernoviae*. [Defra/Fera P. ramorum host list](#) [Defra/Fera P. kernoviae host list](#)
This will enable you, based on a risk assessment [[See P&G5 on Risk assessment and monitoring](#)], to make informed decisions on such aspects as:
 - ~ The range of species that you plant, and their sources
 - ~ Which plants will require close monitoring once they are on-site
 - ~ How to reduce the risk of disease outbreaks by appropriate placement of the plants [[See P&G4 on Design & layout](#)]
- Source plants from a nursery with a good track record of supplying healthy, disease-free stock
- Check whether your supplier belongs to an accreditation scheme. Members of such schemes are independently audited to ensure that they are legally compliant and reach required standards in various aspects of plant production, including pest and disease control. Schemes relevant to producers of nursery stock include:
 - ~ British Ornamental Plant Producers (BOPP)
 - ~ Linking Environment and Farming (LEAF)
 - ~ GLOBALG.A.P. Flowers and Ornamentals Standard
- Develop a relationship with your suppliers – if possible, visit them to check their operation. The appendix to this protocol lists items that could be assessed during such a visit
- Consider using a contract clause requiring that plants have not received an anti-*Phytophthora* fungicide in a six-week period prior to dispatch – fungicides can mask symptom development, but may not kill the *Phytophthora*
- Specify your exact plant requirements in your contract, and ensure that what you receive matches those requirements [[See P&G2 on Handling plants on arrival](#)]

- Ensure that plants, where required, have the correct official documentation – a phytosanitary certificate for plants imported from outside the European Union and a plant passport for movements of key susceptible species within the European Union [[See P&G14 on Plant Passports](#)]
- Keep accurate records of all bought-in plant material, including the supplier, date of arrival, previous cropping history and treatments applied (liaise with the supplier over this), plant passport details where relevant (these must be retained for at least twelve months) and any batch or consignment numbers. Retain all invoices and official documents
- Be aware that large, semi-mature plants may pose a higher risk of introducing *Phytophthora* and other pests and diseases than smaller, younger plants, as they can be more difficult to inspect for symptoms
- Be careful about accepting plants donated from another garden or from private individuals, particularly high-risk species that are common hosts of *Phytophthora*. Although the gifts are well-intentioned, the plants pose a high risk of introducing *Phytophthora* into your garden
- Whenever possible, purchase plants that have been propagated and produced within the UK; these are also likely to be better 'acclimatised' to our conditions and will minimise the distance that the plants have travelled

Appendix 1

SUPPLIER CHECKLIST

N.B. It is always advisable to maintain a close relationship with your suppliers, and a reputable supplier should not object to your asking to visit their production site(s) and to discuss or view the various factors listed below.

If you have multiple suppliers and/or suppliers located considerable distances away, time and resource limitations may prevent you from carrying out the type of detailed visit to each supplier as listed below. However, if you are aware of other parks or gardens that purchase plants from the same suppliers, there may be scope for exchange of information between you. Remember that, if your supplier is a member of an accreditation scheme, it will have been independently audited.

	Check	Notes
<p>Nursery infrastructure: [See P&G7 on Hygiene, P&G6 on Husbandry and P&G4 on Design & layout] (e.g. glasshouses, paths, benches, supports)</p> <p>Look for: In a good state of repair; clean, unbroken glass panes; tidy; free from old plants, plant debris and weeds; no signs of drainage or flooding problems.</p>		
<p>Watering / irrigation: [See P&G8 on water management]</p> <p>Look for: Supply: non-mains water should be subject to testing and disinfection; ideally low-level irrigation (e.g. drip-point watering or drained sandbeds) and preferably not overhead irrigation that can spread <i>Phytophthora</i>; end-of-season disinfection of irrigation lines; replacement or disinfection of capillary matting.</p>		
<p>Source or origin of plants (their provenance):</p> <p>Look for: evidence that the nursery knows the origin of their plants – ask specifically where the nursery and their suppliers source their plants.</p>		
<p>Documentation:</p> <p>Look for: delivery notes to confirm that plants comply with all necessary plant health legislation, e.g. plant passport requirements, name of supplier and origin of material.</p>		

<p>Plant husbandry and health:</p> <p>Look for: healthy, vigorous plants; plants not growing in standing water or fallen over (where they can pick up <i>Phytophthora</i>); correct watering, nutrition and growing conditions, not pot bound, not too soft or leggy; good plant-handling systems avoiding unnecessary plant damage and the risk of cross-infection; no visible evidence of <i>Phytophthora</i> symptoms.</p>		
<p>Pesticides:</p> <p>Look for: responsible use of pesticides; consider a contract clause stating that the plants have not been sprayed with anti-<i>Phytophthora</i> fungicides for six weeks prior to supply, because of the risk that these fungicides may mask infection.</p>		
<p>Phytophthora status:</p> <p>Look for: signs of disease on plants, including those surrounding the nursery; ask about any previous outbreaks and reassure yourself that the nursery is now disease free.</p>		
<p>Waste management: [See P&G9 on Disposal of plant waste]</p> <p>Look for: appropriate disposal of used material; any waste; tips sited well away from production areas, with no risk of water movement to production areas.</p>		

P&G2 HANDLING PLANTS ON ARRIVAL

AIM:

- To reduce the risk of introducing *Phytophthora* into a garden or park on purchased or donated plants

WHY?

- Bought-in (purchased) or brought-in (e.g. donated) plants are the most important way in which *Phytophthora* species (and many other pests and diseases) are introduced into a park or garden
- Careful checking of plants on arrival will significantly reduce the risk of introduction

HOW?

- On arrival, plants must be checked carefully:
 - ~ In a yard or in an area away from the garden; ideally, in a separate unloading area for a quarantine facility [See [P&G3 on Quarantine areas](#)]
 - ~ By staff competent in recognising the symptoms caused by *Phytophthora* species and other pests and diseases, and in the necessary administrative and reporting procedures [See [P&G10 on Staff training](#)]
 - ~ Appropriate hygiene measures should be taken during and after the checking process [See [P&G7 on Hygiene](#)]
- Check all necessary documentation to ensure compliance to your order and, if they are needed for the plants in question, any phytosanitary certificates or plant passport numbers [See [P&G14 on Plant passports](#)]
- Only accept the delivery if you are content that the plants are free from *Phytophthora* and other pests, diseases and weeds, and that all of the paperwork is in order
- If suspect symptoms are present, lateral flow devices (LFDs) can be useful in determining whether *Phytophthora* is responsible [See [P&G16 on Use of LFDs](#)]
- Inform your supplier immediately of any problems. This will be so much easier if your exact requirements were specified on the original contract/purchase order
- Sign, date and retain your copy of the delivery note to confirm that the plants have been checked and are acceptable
- Record the delivery as an accession on any plant database
- Keep accurate records of all bought-in plant material, including the supplier, date of arrival, previous cropping history and treatments applied (liaise with the supplier over these), plant passport details where relevant (these must be retained for at least twelve months), and any batch or consignment numbers. Retain all invoices and delivery notes

- Consider placing the plants in a quarantine area for a monitoring period – check regularly for the development of disease symptoms [[See P&G3 on Quarantine areas](#)]

P&G3 QUARANTINE AREAS

AIM:

- To reduce the risk of introducing *Phytophthora* into the park or garden on purchased or donated plants

WHY?

- Plants bought-in (purchased) or brought-in (e.g. as donations) are the most important way in which *Phytophthora* species (and many other pests and diseases) are introduced into a park or garden
- Careful checking of plants on arrival [[See P&G2 on Handling plants on arrival](#)], followed by a period in a dedicated quarantine area, will significantly reduce the risk of introduction

HOW?

A quarantine area allows plants to be monitored for pest and disease development before they are moved around the garden or planted out. The quarantine area:

- Can range from a separate, outdoor, holding area to (preferably) a protected structure, such as a modified section of an existing glasshouse (with its own entrance), or even a purpose-built glasshouse or polytunnel
- Should be 'isolated' from the rest of the garden, public access and plant production or retail areas (geographically or by access restrictions)
- Should be at least ten metres from any hosts of *Phytophthora ramorum* or *P. kernoviae* outside the quarantine area (to avoid them being included in a Statutory Notice, should one of these pathogens be found on the plants in the quarantine area)
- Should have a single entry point, with signs limiting access, and its own loading / unloading area
- Should have an easily cleaned and disinfected (e.g. concrete) floor
- Should be designed to prevent the accumulation of standing water, and to prevent water running out into, or entering from, other parts of the garden

Staff using the quarantine area:

- Should be restricted in number to a few nominated, trained staff [[See P&G10 on Staff training](#)]
- Should wash / disinfect footwear prior to entering and leaving the area [[See P&G7 on Hygiene](#)]. Provide washing bowls, brushes, soapy water and disinfectant at the entrance

Handry information / hygiene:

- Ensure that plants in the quarantine area are well spaced and have good growing conditions
- Avoid overhead irrigation, if possible, as this can spread *Phytophthora* and other pathogens
- Control weeds in and around the quarantine area
- Take measures to exclude animals (foxes, badgers, deer, mice, cats, dogs, etc.) that could spread plant pests and diseases
- Use tools and equipment dedicated to the area – colour-code or clearly mark them to help with this. Clean and disinfect them regularly
- Do not use anti-*Phytophthora* fungicides for a minimum of six weeks after taking delivery of the plants
- Collect and transport plant waste from the quarantine area in sealed bags or containers. Dispose of it in an appropriate manner [See [P&G9 on Disposal of plant waste](#)]

Monitoring: [See [P&G5 on Risk assessment & monitoring](#)]

- Monitor plants for a minimum of two weeks if you are confident that no anti-*Phytophthora* fungicides have been used by the supplier prior to dispatch of the plants [See [P&G1 on Sourcing plants](#)]. This period should be increased if the weather is cold or dry immediately after receipt of the plants
- If there is a possibility that anti-*Phytophthora* fungicides have been used prior to dispatch of the plants, the monitoring period should, where possible, be increased to six weeks. This will allow time for fungicide residues to decline, following which any *Phytophthora* present may become active again and produce symptoms
- Monitor plants at least weekly (daily is better) and consider the use of lateral flow devices (LFDs) to help identify symptoms caused by *Phytophthora* [See [P&G16 on Use of LFDs](#)]
- Inform the relevant Plant Health Authority if you find symptoms that you suspect could be due to *Phytophthora ramorum* or *P. kernoviae* [See [P&G13 on Outbreak situations](#)]
- In specific cases (e.g. dormant deciduous plants arriving on-site many weeks before they leaf out, or bare-root material intended for immediate planting), the use of the quarantine area may be impractical, or of limited effectiveness. In these cases, the threat can be reduced by risk assessment and planning, for example by avoiding this type of material or delivery time, where possible, for known key hosts of *Phytophthora ramorum* or *P. kernoviae*. If such material is used, it should be monitored very closely after it is planted out in the garden

P&G4 DESIGN & LAYOUT

AIM:

- To reduce the risk of introducing and spreading *Phytophthora* species (and other pests and diseases) through appropriate design and layout of the park or garden

WHY?:

- There are certain key pathways by which pests and pathogens can arrive at a park or garden, and subsequently spread through it. These include arrival on bought-in plants or donated material, and subsequent spread via contaminated debris, tools or water
- Some areas of a park or garden are likely to be at greater risk of *Phytophthora* diseases as a result of their microclimate, soil type and drainage, etc. Prior knowledge of these areas will enable the risk of a significant outbreak to be reduced through planning, monitoring and, if appropriate, remedial action

HOW?:

Many established parks and gardens have a design and structure that has been developed over years, decades or even centuries, often as a result of the inspiration and dedication of great plantsmen and garden designers. It would be inappropriate to suggest that dramatic changes should be made to such gardens simply to reduce the risk of potential pest and disease problems. However, an outbreak of a notifiable pathogen such as *Phytophthora ramorum* or *P. kernoviae* can itself have a huge impact on the character of a garden, as a result of the action needed to try and contain or eradicate the problem.

Even the most established park or garden is changing constantly and, when renovations or new features are planned, it is certainly worth considering how the design might affect the risk of outbreaks or further spread of pests or diseases. When a new park or garden is designed from scratch, there is obviously much more scope in terms of maximising the biosecurity of the site.

Consideration of the following aspects will help to reduce the risk of outbreaks or spread of *Phytophthora* diseases, and also of many other pests and pathogens:

Plant arrival and quarantine areas

[See [P&G2](#) on Handling plants on arrival, and [P&G3](#) on Quarantine areas]

- Quarantine areas (and any associated drainage systems) should be isolated from the main garden and from the public, geographically or by access restrictions
- Such areas are particularly important for plants bought-in for use in the garden itself
- The principles of plant quarantine are also applicable to plants bought-in by gardens for use in sales areas. However, if this is not possible because of constraints such as space or throughput of stock, ensure that the plant sales area (and the arrival point for

deliveries to it) is well away from any quarantine area for bought-in stock to be used in the garden itself

Disposal of plant waste

[See [P&G9](#) on Disposal of plant waste]

- Composting areas, or points where plant waste is held prior to incineration or disposal to landfill, should be isolated from public access
- They should ideally be sited downwind from, and downhill from, the main areas of the garden, so that there is less risk of wind- or water-borne debris spreading back onto the garden
- They should also be sited well away from water sources such as streams, rivers and reservoirs

Beds and borders

[See [P&G5](#) on Risk assessment and monitoring]

- If one does not already exist, produce a map showing the layout of the planting areas in the garden
- Include the locations of different plant species, or at least make a note of areas containing high-risk hosts for *Phytophthora ramorum* and *P. kernoviae* (e.g. *Camellia*, *Pieris*, *Rhododendron* (including any wild *R. ponticum*), *Viburnum*)
- Use this map and the results of a risk assessment to identify high-risk areas for monitoring
- When planning new planting areas, assess the site in terms of the potential risk from pests and diseases, and take appropriate action if necessary. For example, improve areas of poor drainage, or match the plants to the site and avoid common hosts of root-infecting *Phytophthora* species

Public access

[See [P&G11](#) on Visitors]

N.B. Readers in Scotland should check whether any restrictions on access comply with the Scottish Outdoor Access Code, if this is applicable to their site. [Outdoor Access Scotland](#)

- Aim to guide visitor movement around the garden by the use of well-maintained, well-signposted, pathways, kept clear of fallen leaves and other debris (hard paving, if appropriate for the garden, is easier to keep debris-free than wood chips, grass, etc)
- Prevent public access to quarantine areas, and composting or plant-waste disposal points

- Restrict public access to areas where there is an on-going outbreak of *Phytophthora*, or of any other pest or disease that could be spread on footwear, clothing, etc

P&G5 RISK ASSESSMENT AND MONITORING

AIM:

- To identify those parks and gardens, and the areas within them, most at risk from infection by *Phytophthora ramorum* and *P. kernoviae*
- To detect any outbreaks as early as possible by the routine monitoring of potential host plants

WHY?:

- Some parks and gardens are more at risk from *Phytophthora ramorum* and *P. kernoviae* than others. Within a park or garden there will also be certain areas that are at greater risk. The risk will depend on factors such as the geographical location of the site (e.g. proximity to other cases of the disease, local climate in terms of rainfall and temperature), the microclimate in different parts of the garden, and the number, location and planting density of the various plant species susceptible to the pathogens
- Any site buying in plants of susceptible hosts is at risk of importing these pathogens, however
- Identification of high-risk areas, together with frequent monitoring of host plants in all parts of the garden, will give a greater chance of detecting and eradicating outbreaks before they become more widespread

HOW?:

Risk assessment

The following should be considered when assessing the risk of *Phytophthora ramorum* or *P. kernoviae* outbreaks for a park or garden as a whole, or for specific areas within it:

- Information on the prevalence of other findings in the local area. For example, whilst not providing details of specific outbreak sites, Defra and the Forestry Commission produce maps showing the distribution of outbreaks in the UK (Defra maps show outbreaks in the natural environment in England and Wales only). [FC *P. ramorum* Distribution](#) [Fera *P. ramorum* distribution](#) [Fera *P. kernoviae* distribution](#)
- Information on the prevailing climate. Outbreaks are more likely to occur in areas with high summer rainfall and high relative humidity (e.g. south-west England) than in those with a drier climate – although there are always exceptions
- The range and number of potential host plants grown and their location in the garden. [Defra / Fera *P. ramorum* host list](#) [Defra / Fera *P. kernoviae* host list](#)
The production of maps showing the location of these plants will be a valuable aid in subsequent monitoring

- The type of planting and the microclimate in different parts of the garden. For example, large numbers of host plants growing in areas of poor air circulation (due to dense growth, overhanging trees, etc.) may be more at risk than isolated specimens growing in exposed conditions (although again there are often exceptions)
- The presence of *Rhododendron ponticum* (a common host and source of these pathogens) in the garden, and the quantity, density and location (e.g. in relation to other hosts) of the plants
- The location of any plant sales areas, particularly if plants are bought-in for sale. These areas are at high risk, because plants may be arriving from many different locations, and there may be a wide range of different host plants present in a small area. Both the sales area and the parts of the garden immediately adjacent to it should be priority areas for monitoring
- The locations where host plants bought-in for use in the park or garden are received or held, prior to being distributed over the site. These are particularly high-risk and are best dealt with by the use of a quarantine area, which will require very frequent monitoring
[See [P&G1 on Sourcing plants](#), [P&G2 on Handling plants on arrival](#) and [P&G3 on Quarantine areas](#)]
- Areas of high footfall (if host plants are present) – there is a risk that visitors to the garden could introduce the pathogens on contaminated footwear, or could spread an existing infection in a similar fashion
- The amount of attention given to husbandry, hygiene and water management techniques aimed at reducing the risks of infection. Following the measures outlined in the appropriate best-practice protocols can greatly reduce the risk [See [P&G6 on Husbandry](#), [P&G7 on Hygiene](#) and [P&G8 on Water management](#)]

Monitoring

All staff working with host plants should receive training in, or be made aware of, *Phytophthora ramorum* and *P. kernoviae* (e.g. common host plants, symptoms, methods of spread, hygiene measures). [See [P&G10 on Staff training](#)] This will enable them to check for suspected cases whilst undertaking their normal duties. However, specific and regular surveillance of the garden for symptoms caused by these pathogens will increase the chances of early detection.

- The monitoring should ideally be undertaken by the same staff on each occasion, so that they are familiar with the locations of high-risk areas, and of previous suspect cases and their outcomes.
- These staff should familiarise themselves with the symptoms caused by the pathogens on as many of the host plants as possible [See [P&G15 on Information sources](#)]
[Fera information](#) [FC information](#)
- The staff should ideally be aware of other diseases, pests and disorders causing similar symptoms; although, if there is any doubt as to the cause, it should be dealt with as a suspected case of *P. ramorum* or *P. kernoviae*

- The frequency of monitoring should be related to the time of year. Spring, summer and early autumn are most important, as the disease is more likely to be spreading at these times, and deciduous hosts will have leaves present. Consider weekly or fortnightly monitoring at these times, particularly if weather conditions are favourable for the pathogens (i.e. mild and wet). Monitoring can be less frequent in winter and should concentrate on evergreen hosts (although symptoms of bleeding canker on deciduous trees may still be obvious)
- The production of distribution maps of host plants (and of *Rhododendron ponticum*, if present), together with the results of a risk assessment (see above) will enable the targeting and prioritisation of high-risk areas
- Consider the use of lateral flow devices (LFDs) to test suspect symptoms for the presence of *Phytophthora* (N.B. these tests are not specific for *P.ramorum* or *P.kernoviae*). Staff undertaking the monitoring should be given training in their use [See [P&G16 on Use of LFDs](#)], [Forsite](#)
- The staff should be given full training in hygiene techniques associated with working in disease-affected areas and the testing of potentially infected material [See [P&G7 on Hygiene](#)]
- Staff undertaking monitoring should be familiar with the action to be taken with regard to the reporting of suspect cases [See [P&G13 on Outbreak situations](#)]

P&G6 HUSBANDRY

AIM:

- To use husbandry techniques that minimise the risk of the outbreak or spread of *Phytophthora* diseases (and of many other pests and diseases)

WHY?:

- Whilst many pathogens (including *Phytophthora* species) are capable of attacking vigorous, healthy plants, a stressed plant is likely to succumb to disease more rapidly. Some other pathogens can only attack a plant that has been previously weakened or damaged in some way
- Good husbandry techniques can also prevent the pathogen from coming into contact with its host plant in the first place or, if contact is made, can reduce disease levels by creating environmental conditions that are unfavourable for the pathogen

HOW?:

Planting

Newly planted material is much more likely to come under stress until it has established a substantial root system. Poor planning can also lead to plants being placed in inappropriate conditions, or in areas where disease is already present.

- Avoid plant stress by matching plants to the conditions, e.g. soil type and moisture levels, pH, likely minimum temperature, exposure of site (to wind, frost and sun)
- Use healthy planting material [[See P&G1 on Sourcing plants](#), [P&G2 on Handling plants on arrival](#), and [P&G3 on Quarantine areas](#)]
- Avoid potentially contaminated areas where disease has occurred previously, particularly if it was caused by a pathogen that produces long-lived resting spores (this includes both root-infecting *Phytophthora* species, and species affecting aerial parts, such as *P. ramorum* and *P. kernoviae*). Consider the treatment of such areas with a soil sterilant prior to planting. If this is not possible, choose plant species that are tolerant or resistant to the pathogen. N.B. Outbreaks of *P. ramorum* or *P. kernoviae* will be dealt with under Statutory Notice from the relevant Plant Health Authority [[See P&G13 on Outbreak situations](#)]
- Ensure that there is thorough soil preparation prior to planting. Attempt to improve the drainage of waterlogged areas (or use plants suited to these conditions). Planting on a low mound on heavy soils will help to encourage rapid drainage around the root system. Do not refill a planting hole with a material lighter than the surrounding soil, as this can create a sump that may fill with water
- Space plants as widely as possible to ensure good air movement

- Water regularly during periods of drought, until the plant is well-established (this may take two years or more) [[See P&G8 on Water management](#)]

Nutrition

- Monitor both plants and compost/soil regularly for nutrient deficiencies
- Correct significant deficiencies using fertilisers or foliar feeds
- Avoid overuse of nitrogenous fertilisers, or the use of fertilisers in late summer/autumn – this can promote soft growth that is susceptible to damage and infection

Pruning

- If appropriate for the plant, both formative and then maintenance pruning can be carried out to produce a more 'open' growth habit, allowing good air circulation and a reduced risk of infection by foliar pathogens, including *Phytophthora ramorum* and *P. kernoviae*
- To minimise the visual impact for visitors when extensive pruning is required, alternately prune the front of one plant and the back of the adjacent plant one year, and then alternate the next year
- Pruning during dry weather allows cut surfaces time to heal, whilst conditions are unfavourable for pathogens that might colonise the wounded tissue. However, do not prune during a prolonged drought, as this will increase plant stress
- Take appropriate hygiene precautions during the pruning out of diseased material [[See P&G7 on Hygiene](#)]

Avoiding soil contamination of foliage

Soil splashed onto the lower leaves by heavy rain or during irrigation can result in aerial parts of the plant picking up infection from the soil. To help to prevent this:

- Mulch the soil surface around plants – of course, this has other important benefits, such as preventing water loss, suppressing weeds and, depending on the mulch used, adding organic matter and nutrients to the soil
- Consider the removal of lower leaves or branches (particularly where this type of infection has occurred in the past)
- Avoid taking cuttings from branches that could have experienced soil-splash – there is a high risk of introducing *Phytophthora* (and other soil-borne pathogens such as *Pythium*, *Rhizoctonia* and *Thielaviopsis*) into the propagation area

Rhododendron ponticum

This plant is an important source of *Phytophthora ramorum* and *P. kernoviae* (as well as the wild form being an aggressive weed plant). Many cases of these pathogens on trees can be linked to an infected understorey of *Rhododendron ponticum*.

- Develop an action programme for the removal of wild *R. ponticum* from the park or garden
- Detailed guidance on clearance methods is published by the [Forestry Commission](#)
- If complete removal of wild *R. ponticum* is not possible:
 - ~ Clear plants away from the trunks of trees, to a distance of at least two metres
 - ~ Prune remaining plants after flowering to stop them from producing seed
 - ~ Remove any seedlings that appear, or strim them to ground level

P&G7 HYGIENE

[See [P&G6](#) on Husbandry and [P&G8](#) on Water management, which need to be read in conjunction with this protocol]

AIM:

- To reduce the risk of spreading *Phytophthora* (and many other pests and diseases) within and between parks and gardens, by the use of appropriate hygiene methods

WHY?:

- *Phytophthora* species, including *P. ramorum* and *P. kernoviae*, produce long-lived resting spores that may contaminate soil for several years. These resting spores can also contaminate pots, trays, growing media, etc
- Strict hygiene measures will greatly reduce the risk of contamination and spread, not only of diseases caused by *Phytophthora* but also other fungal, bacterial and virus diseases, and even some pests

HOW?:

Contaminated plant debris, soil and compost

[See [P&G9](#) on Disposal of plant waste]

These are very common sources of *Phytophthora*. The leaves and shoots of plants affected by aerial *Phytophthora* diseases (including those caused by *P. ramorum* and *P. kernoviae*) frequently contain resting spores that will be released as the material rots down. Similarly, plants affected by root-infecting *Phytophthora* species are likely to harbour resting spores in the roots and stem base.

- Remove fallen leaves from pathways, where they could be picked up on the feet of visitors and the wheels of garden vehicles or machinery
- Where there is no obvious infection by an aerial *Phytophthora* disease, the leaves could simply be moved onto borders using leaf blowers
- Where aerial *Phytophthora* infection is present, fallen leaf debris (and any prunings) on both paths and borders should be collected up and removed promptly for destruction, using an appropriate method (usually burning or deep burial). If *Phytophthora ramorum* or *P. kernoviae* is present, this should be done in accordance with the Statutory Notice issued by the relevant Plant Health Authority [[See P&G13 on Outbreak situations](#)]
- Grass clippings from lawns adjacent to areas affected by *P. ramorum* and *P. kernoviae* could contain contaminated leaf debris. These clippings should be dried and burnt, rather than used for composting or mulching

- Consider the removal and destruction of fallen leaves and plant debris from common hosts of *P. ramorum* and *P. kernoviae*, even if infection is not present
- Trailers, wheelbarrows, etc. used to remove such debris should be covered. The covers should be cleaned and disinfected regularly (see below for further information on disinfectants). If material is removed in bags, these should be sealed and checked to ensure that they have not split
- Where a root-infecting *Phytophthora* species is present, ensure that at least the root system and stem base of an affected plant is destroyed
- Cover any items that could be exposed to contaminated plant debris, soil or compost blowing around the site, e.g. pots/trays, bulk compost storage areas, water storage tanks
- Remove plant and compost debris from production and sales areas regularly. Consider the use of a permeable membrane (e.g. Mypex) in such areas, as this is relatively easy to sweep clean of debris

Tools and equipment (including footwear)

- Tools and equipment should be cleaned and disinfected regularly (see below for further information on disinfectants)
- Secateurs, pruning saws and cutting knives carry a high risk of transferring a range of diseases. They should be cleaned and treated frequently, even between individual plants if removing diseased plant parts or taking cutting material
- In large parks or gardens, consider the use of dedicated tools for different areas, particularly if there is an area of known infection
- Mowers used in areas of known *Phytophthora ramorum* or *P. kernoviae* infection may pick up contaminated leaf debris, and should be cleaned and disinfected regularly

Pots and trays

Old pots and trays may well be contaminated by fungal resting spores and structures, not only of *Phytophthora* species but also of other pathogens such as *Pythium*, *Rhizoctonia* and *Thielaviopsis*.

- Use new pots and trays whenever possible
- Treat any re-used pots and trays with a disinfectant (see below for further information on disinfectants)
- Cover unused pots and trays

Hand hygiene

- Hands should be protected from contamination or cleaned regularly, particularly if working with infected plants or in known infected areas
- Hands can be washed in hot, soapy water, but a more practical alternative in outdoor situations is the use of proprietary hand gels or foams. If gloves are worn, these should either be of a disposable type or cleaned regularly

Propagation material

- Only use cutting material from healthy, disease-free plants. If required, stock plants can be laboratory tested to check for the presence of *Phytophthora* and other pathogens [See [P&G15 on Information sources](#)]
- Do not take cuttings from branches close to the soil or growing medium – these could be contaminated by water-splashed soil or compost containing resting spores
- Clean and disinfect cutting knives and secateurs very regularly (see below for further information on disinfectants)
- Wash hands regularly or use a proprietary hand gel/foam or disposable gloves
- Practice scrupulous hygiene in the propagation area – material infected here has the potential to spread the disease very widely and very quickly if planted throughout the park or garden

Use of disinfectants

The following should be cleaned and treated regularly with a disinfectant active against *Phytophthora* (essential in areas where the disease is present):

- Tools and equipment (including footwear)
- Re-used pots and trays (ideally use new ones)
- Re-used Mypex and capillary matting (this may allow use for more than one year, but they should still be replaced regularly)
- Sand/gravel/concrete standing areas
- Water storage tanks and irrigation systems (e.g. drip lines, capillary sand beds)
- Glasshouse floor and structure (check that the product is safe to use on metal)

Seek professional advice on the use of disinfectants and soil sterilisers.

In laboratory tests, disinfectants based on 70% denatured ethanol (IMS) have proved most effective against *P. ramorum*.

There are many proprietary disinfectant products available. Some disinfectants (e.g. quaternary ammonium compounds) are quickly inactivated by organic debris, so items to be treated should be cleaned and washed thoroughly first to remove as much soil or compost as possible. Products have various recommendations for use as sprays, fogs, dips, etc. Some products produce harmful vapours that can damage plants; others can be used safely with plants nearby.

These types of disinfectant are not suitable (and most cannot be used legally) as soil treatments. Where soil contamination with *Phytophthora* has occurred, use of a specific soil sterilant or biofumigant could be considered (if *P. ramorum* or *P. kernoviae* is present, treatment should be done in accordance with the Statutory Notice issued by the relevant Plant Health Authority).

P&G8 WATER MANAGEMENT

AIM:

- To reduce the risk of spreading *Phytophthora* on your premises.

WHY?:

- *Phytophthora* (and *Pythium*) species are known commonly as ‘water moulds’
- The diseases that they cause can spread rapidly if untreated, contaminated water is used for irrigation
- Poor drainage / waterlogging and standing water provide ideal conditions for the spread of root-infecting *Phytophthora* and *Pythium* species. The localised high humidity found in these areas, and the risk of mud- and water-splash, are also favourable for outbreaks of many foliar pathogens, including *Phytophthora ramorum* and *P. kernoviae*

HOW?:

- Consider your source of irrigation water:
 - ~ Mains water should be free from pathogens, but is expensive and subject to restrictions on use
 - ~ Borehole water, if available, is usually pathogen-free.
 - ~ River or reservoir water may contain *Phytophthora*, *Pythium* and other pathogens
 - ~ Water collected on-site can pose a significant risk
- Test water collected on-site or abstracted from rivers or reservoirs for *Phytophthora*, at regular intervals (at least annually). Whatever the source, water should be tested if it is re-used or stored before use
- Ensure that water storage tanks are covered, to prevent contamination with plant, soil or compost debris that could contain spores of *Phytophthora* and other pathogens
- If water is re-used, or obtained from a high-risk source (see above), it should be treated prior to being used for irrigation. Treatment methods include slow sand filtration, ultra-violet light, chlorination and ozone treatment – suitability for a given situation will vary according to factors such as the volume of water requiring treatment, the cost of the various systems and the space available (e.g. for sand filters), and should be determined on a case-by-case basis
- Consider your irrigation method:
 - ~ Overhead irrigation poses the greatest risk of spreading *P. ramorum* / *P. kernoviae* and many other foliar diseases. Ensure that it is used in a controlled way to minimise water splash. Avoid evening or night-time irrigation, if possible, as this can result in extended periods of leaf wetness that are conducive to infection by many foliar pathogens
 - ~ Sub-irrigation methods (e.g. capillary matting, drip lines or lay-flat tubing), when appropriate and economic, avoid leaf wetness and are therefore of lower risk.

Consider them, for example, for use in plant sales areas or in newly planted borders

~ Whichever method is used, do not overwater!

- Growing plants in a protected structure (glasshouse or polytunnel) will give protection against rain-splash of spores. However, the higher humidities often found in such structures can still lead to significant outbreaks of some foliar diseases
- Use appropriate husbandry techniques to reduce the risk of infection and spread of diseases caused by *Phytophthora* and other water-borne pathogens:
 - ~ Regularly clean and disinfect water storage tanks, and flush through irrigation lines periodically with a suitable disinfectant
 - ~ Change or disinfect capillary matting before re-use
 - ~ Do not use hosepipes from known infected areas of a garden in uninfected areas. Similarly, if using a hose or lance for irrigation in a nursery or sales area, do not allow the end to come into contact with the floor or soil – it may become contaminated with soil or debris containing spores of *Phytophthora*, *Pythium* and other pathogens
- Good drainage and the avoidance of waterlogging or standing water is very important:
 - ~ Attempt to improve the drainage of heavy or waterlogged soils (or match the plants to the situation and avoid hosts susceptible to root-infecting *Phytophthora* species)
 - ~ Planting on a low mound on heavy soils will help to encourage rapid drainage around the roots
 - ~ Do not refill planting holes with a material lighter than the surrounding soil, as this can create a sump which will fill with water
 - ~ Ensure that any existing drainage system is maintained regularly so that it operates at optimum efficiency
 - ~ In flood-prone gardens, consider methods to prevent flood water reaching valued or susceptible plants. For example, lawns could act as ‘flood plains’ in areas that are affected regularly, or the flood water could be deflected along gullies
 - ~ Maintain and repair pathways regularly to prevent puddling
 - ~ Take steps to re-establish good drainage in areas of the garden that may have become compacted by machinery or heavy foot-traffic following the staging of large public events

P&G9 DISPOSAL OF PLANT WASTE

AIM:

- To ensure that all plant waste is disposed of in a safe manner, without risk of spreading disease or damaging the environment

WHY?:

- All plant waste (e.g. dead plants, fallen leaves, prunings) has the potential to harbour pests and diseases, including *Phytophthora* species. These could be spread around a park or garden if the waste is moved or disposed of in an uncontrolled manner
- Regulations are also in place to ensure that waste is recovered or disposed of without endangering human health or the environment

HOW?:

N.B. Where an outbreak of a notifiable pathogen such as *Phytophthora ramorum* or *P. kernoviae* has occurred, the destruction of affected material (usually by burning, or by deep burial at an approved landfill site) will need to be carried out under a Statutory Notice issued by the relevant Plant Health Authority. Usually, such notices also require the destruction of associated containers, and of soils or growing media that have been used with the diseased plants. Statutory Notices carry a deadline for implementation. [[See P&G13 on outbreak situations](#)]

The rest of this protocol deals with the routine disposal of plant waste when there is no notifiable pest or pathogen present, although the material may well contain a number of other pest or disease organisms (including other species of *Phytophthora*).

Collection of plant waste

- Material that is obviously diseased, and which poses a risk to plants in unaffected parts of the park or garden, should be transported and stored in a covered container until it can be disposed of
- Take suitable hygiene precautions when dealing with diseased material [[See P&G7 on Hygiene](#)]
- Non-diseased material (or material affected by common pest or disease problems present throughout the site) can be stored temporarily in an uncovered area. However, this should be in an area that is free from public access, and, ideally, both downwind and downhill from the rest of the site (so that the debris is not carried back onto the site by wind or water)

Disposal of Plant Waste

General information

In 2006, agricultural (including horticultural) waste was incorporated into the regulations that control the management of other commercial and industrial waste. In order to ensure that waste is recovered or disposed of without endangering human health or harming the environment, a permit is required by any establishment or undertaking carrying out a waste-management activity. In England and Wales, these permits are issued by the Environment Agency under the Environmental Permitting Regulations (England and Wales) 2010. Separate rules and regulations are in place in Scotland and Northern Ireland.

However, many of the waste treatment and disposal operations carried out by the horticultural industry (including parks and gardens) can be registered as 'exemptions' with the Environment Agency, meaning that a full permit is not required. It is currently free to register for such exemptions. Details of exemptions (and other relevant rules) are given under the appropriate handling or disposal method.

There are a number of ways in which waste plant material can be treated or disposed of, some of which (e.g. composting) have additional benefits. Those most likely to be used by parks and gardens are:

- Composting
- Burning
- Disposal to landfill

Composting

In addition to providing nutrients and organic matter, composting can also eliminate pests and pathogens, if done correctly. The two most common types of composting are:

- Heaps or windrows
- In-vessel systems, e.g. containers, silos, rotating drums

In-vessel systems give greater control over environmental conditions, and, as they are enclosed, there is also less risk of spreading pathogens (in some cases this enables meat products to be composted as well as vegetable matter). Heap or windrow systems are usually less expensive per equivalent volume of material treated.

- Both types of composting are exothermic, relying on the generation of high temperatures
- Both types are aerobic – the microorganisms breaking down the plant matter require oxygen
- Macerated or shredded material will compost faster than bulky items
- Heaps or windrows must be turned regularly to ensure that there is sufficient aeration (otherwise anaerobic conditions and foul odours may develop) and that no material stays permanently on the outside, where temperatures are much lower than within the heap. It is possible to set up an aerated heap or windrow system, in which air is sucked or blown

through the compost

- Some in-vessel systems macerate, turn and aerate the material automatically
- To eliminate most pests and diseases, temperatures should reach at least 55°C for a continuous period of two weeks, or 65° for a continuous period of one week (at least 60°C for enclosed systems) (Reference: [EPPO PM 3/66 Guidelines for the management of plant health risks of biowaste of plant origin](#)). These temperatures have been sufficient to kill resting spores of *Phytophthora* species in various research projects
- Pathogens producing very resilient resting spores may require higher temperatures
- Exemption T23 covers the production of aerobic compost, whilst Exemption U11 allows the resulting compost to be spread on park or garden land. There are limits on the amount of compost that can be produced or spread at any one time – full details from the Environment Agency
 - ~ [Environment Agency 117109 \(Exemption T23\)](#)
 - ~ [Environment Agency 116324 \(Exemption U11\)](#)
- The Environment Agency also prescribes the base needed for the composting area, which is dependent on the types of material being composted
- Many local authorities accept material of commercial origin to supplement domestic waste in their composting systems. Charges are usually less than for sending material to landfill

Burning

Material can be burned:

- On-site. Exemption D6 covers the burning of plant waste in an incinerator, whilst Exemption D7 covers the burning of plant waste in the open. As with composting, there are limits to the amount of material that can be processed in these ways at any one time
 - ~ [Environment Agency 117125 \(Exemption D6\)](#)
 - ~ [Environment Agency 117127 \(Exemption D7\)](#)
- Off-site at a commercial incinerator

Landfill

- Waste material intended for landfill at a local-authority-approved landfill site is subject to various regulations, primarily the Landfill Directive
- The producer of the waste has a duty of care, under this directive, to ensure that the waste is only delivered to a site capable of dealing with waste of that type. If a waste carrier is used to collect the waste, the producer of the waste must check that the carrier is licensed with the Environment Agency
- The NetRegs waste directory allows a producer of waste to search for local sites for disposal or recycling, and also for local carriers, of various waste materials, including

green wastes [waste directory](#)

- Under the Landfill Directive, nearly all waste must be treated in some way before it is sent to landfill, so that part of it is recycled, its volume is reduced or its hazard reduced in some way. In terms of plant waste, examples of treatment include composting or burning

Further details on the Landfill Directive are available from the Environment Agency.

[Environment Agency 89988](#)

General guidance for the treatment of horticultural waste to minimise plant health risks is available in the Food and Environment Research Agency (Fera) document *Code of Practice for the Management of Agricultural and Horticultural Waste*: [Code of Practice](#)

P&G10 STAFF TRAINING

AIM:

- To familiarise staff with the symptoms caused by *Phytophthora* diseases such as *P. ramorum* and *P. kernoviae*, how to prevent spread of the diseases and what to do when a suspected outbreak occurs

WHY?:

- Well-trained parks and garden staff are crucial to the early recognition of *Phytophthora* outbreaks, since they will be working most closely with the plants. They also need to know the procedures to follow when a suspected case occurs
- Training in the correct hygiene and husbandry techniques will help to prevent inadvertent spread of these diseases by staff

HOW?:

All parks and garden staff (and volunteer workers if they are used) working with susceptible host plants should be given training in, or be made aware of, of the following aspects of *Phytophthora* diseases:

- Common host plants and symptoms [Defra / Fera *P. ramorum* host list](#) [Defra / Fera *P. kernoviae* host list](#)
- How to prevent the spread of disease by use of appropriate hygiene and husbandry techniques [See [P&G7 on Hygiene](#) and [P&G6 on Husbandry](#)]
- What to do if a suspected case of *Phytophthora ramorum* or *P. kernoviae* is found (this may simply entail the provision of contact details for more senior staff to whom the finding should be reported) [See [P&G13 on Outbreak situations](#)]
- The likely action (e.g. Statutory Notice) that will be taken if an outbreak of *P. ramorum* or *P. kernoviae* is confirmed, and how this is to be communicated and managed within the organisation
- How to deal with enquiries from park or garden visitors [See [P&G11 on Visitors](#)]

The method used should be decided on a case-by-case basis, and may range from the simple provision of letters/emails and leaflets on the subject, to group training sessions led by another staff member with previous training or knowledge, or an outside specialist. [See [P&G15 on Information sources](#)] Training records for individual staff should state the level of training received and the date that the training occurred. Regular updates or refresher training should also be given.

Members of staff designated more specific roles in relation to the prevention, control or reporting of these diseases should be given more-detailed training, including the provision of appropriate best-practice protocols for their role. Such roles might include:

- Sourcing of plants [See [P&G1](#) on Sourcing plants]
- Handling of plants on receipt at the park or garden [See [P&G2](#) on Handling plants on arrival]
- Management of a plant quarantine area [See [P&G3](#) on Quarantine areas]
- Risk assessment and surveillance [See [P&G5](#) on Risk assessment and monitoring]
- Reporting of suspected outbreaks of *Phytophthora ramorum* / *P. kernoviae* to the relevant Plant Health Authority [See [P&G13](#) on Outbreak situations]
- Implementation of control measures under a Statutory Notice
- Dealing with press enquiries

P&G11 VISITORS

[See [P&G12](#) on On-site contractors]

AIM:

- To prevent the inadvertent spread of *Phytophthora* species (and other pests and diseases) by visitors to parks and gardens
- To inform the gardening public about the threat posed to ecosystems and gardens by these pathogens

WHY?:

- *Phytophthora* species (including the notifiable pathogens *P. ramorum* and *P. kernoviae*), as well as many other pests and diseases, can be spread all too easily on footwear contaminated by infested soil or plant debris. The wheels of bicycles, prams or buggies and even the paws of dogs can also become contaminated
- Informing (but not unduly alarming!) garden visitors about the threat posed by these pathogens, and the symptoms that they cause, should lead to increased vigilance and the monitoring of a greater area (e.g. private gardens) than would be possible by the Plant Health Authorities alone

HOW?:

- Aim to guide visitor movement around the garden by the use of well-maintained, well-signposted pathways, kept clear of fallen leaves and other debris (hard paving, if appropriate for the garden, is easier to keep debris-free than wood chips, grass, etc.).
- Consider the provision of information for garden visitors on *Phytophthora ramorum* and *P. kernoviae* (and possibly some of the other pests and diseases that pose a threat to parks and gardens). This could take the form of leaflets or posters, located in places such as sales areas or tearooms, but should not be overdone – a large display featuring many different pests and diseases could create alarm!
- Provide general information on how the spread of pests and diseases from site to site can be prevented. This could take the form of a leaflet providing general information such as:
 - ~ Cleaning of footwear, wheels, paws, etc. before entering or leaving the garden
 - ~ Keeping to paths, not walking on borders or entering any cordoned-off areas
 - ~ Not removing plant material from the site (other than purchases from plant sales areas)
 - ~ Keeping dogs on short leads
 - ~ Sources of further information (books, websites etc.) on pests and diseases and their control

[Fera general information](#)

[Phytophthora – Don't Let It Destroy Our Environment](#)

- Ensure that any quarantine area is well signposted to prevent visitors from entering it
- Where there is an ongoing outbreak of *Phytophthora ramorum* or *P. kernoviae*, formulate a strategy for the provision of information to visitors
- If the outbreak is in an isolated part of the garden, it may be appropriate simply to restrict access, without providing detailed information on the reasons for this
- If the outbreak is in a prominent area normally frequented by lots of visitors, it may be more appropriate (in addition to cordoning off the area) to provide some on-site information (e.g. a display board), including:
 - ~ The reason for the access restriction
 - ~ General information about the disease
 - ~ How the problem is being dealt with in the garden, including any statutory requirements under Plant Health Orders
 - ~ Copies of leaflets as outlined above
- In addition to restricting access to the affected area, if possible re-route paths so that visitors are diverted away from the outbreak

N.B. Readers in Scotland should check whether any restrictions on access comply with the Scottish Outdoor Access Code, if this is applicable to their site [Outdoor access Scotland](#)

P&G12 ON-SITE CONTRACTORS

AIM:

- To prevent the inadvertent spread by contractors of *Phytophthora* species (and other pests and diseases) around and between parks and gardens

WHY?:

- Many pests and pathogens, including *Phytophthora* species, can be transferred around and between sites on footwear, tools, machinery or vehicles contaminated with infested soil and/or plant debris

HOW?:

Certain contractors, such as builders or utilities services, may only visit specific and localised parts of a park or garden during their work. However, they should still be made aware of the risks of spreading plant pests and diseases if:

- Their work will entail the movement or disposal of any soil or plant material
- They have been working previously at a site where there is a risk of contamination of tools or vehicles by infested soil or plant debris – if there is any doubt, their equipment should be cleaned before coming on-site
- Their vehicles or tools are likely to become contaminated with soil or plant debris when they are gaining access to, or are at, the location in the garden where they are working

Other contractors (e.g. landscapers, tree surgeons, horticultural advisors) are likely to require more widespread and extensive access to the site, and will have closer contact with the plants and planting areas. The risk here is greater, and they will require more detailed guidance and checks, as listed below:

General guidance

- Before engaging contractors who will have extensive access to the site and/or its plants, ensure that they are aware of their responsibilities with regard to preventing the spread of pests and diseases around and between sites. Ask whether they have any existing written procedures in place to deal with this – if so, ask to see copies
- If the contractors do not have their own, satisfactory protocols, provide them with a copy of this best-practice protocol and, if relevant to their work, the protocols on husbandry ([P&G6](#)), hygiene ([P&G7](#)) and disposal of plant waste ([P&G9](#)), for guidance
- As a minimum requirement, contractors should ensure that their footwear, vehicles and equipment (particularly tyres) are clean before they enter or leave the park or garden. Clean footwear is particularly important if their work (e.g. that of horticultural advisors) involves routinely visiting and walking round commercial nurseries. Any plant material, soil or compost that has been sampled from other gardens or nurseries should be left in

their vehicle in a sealed container. Tools used for such sampling should have been cleaned and disinfected

- Their tools (e.g. a tree surgeon's pruning equipment) should be cleaned and disinfected regularly when moving between different areas of the garden. If work is being carried out on diseased plant material, cleaning and disinfection will be required between plants or even between branches on the same plant
- Ensure that quarantine areas for bought-in or donated stock are well signposted to prevent contractors from entering them without permission

Specific guidance for on-going pest or disease outbreaks

- Where there is a significant outbreak in the garden of a pest or disease that could be spread by contractors working with or in proximity to the plants, the risk is obviously higher (particularly if a notifiable pathogen such as *Phytophthora ramorum* or *P. kernoviae* is involved)
- Ensure that contractors are made aware, before coming on to the site, of the presence of the pest or disease
- Provide them with information on the symptoms of the problem and the methods by which it spreads, if they are unaware of these. [See [P&G15 on Information sources](#)] Ask them to liaise with you regarding any suspicious symptoms that they may come across during the course of their work, particularly if these are in areas currently thought to be unaffected
- Where a notifiable pathogen such as *P. ramorum* or *P. kernoviae* is involved, provide the contractor with all necessary details to allow them to work without risk of spreading the organism, and to comply with any requirements that have been issued as part of a Statutory Notice by the relevant Plant Health Authority. Such details would include:
 - ~ The locations of affected areas and any specific restrictions on access
 - ~ Relevant hygiene measures, including the disposal of waste material and the cleaning and disinfection of footwear, tools, machinery, etc. before leaving either the affected areas or the site as a whole

P&G13 *PHYTOPHTHORA RAMORUM* / *P. KERNOVIAE* – OUTBREAK SITUATIONS

AIM:

- To reduce the impact of an outbreak by prompt detection, reporting and action

WHY?:

- A widespread outbreak of *Phytophthora ramorum* or *P. kernoviae* can significantly alter the character of a park or garden, as a result of the action needed to contain and eradicate the problem
- There could be financial implications in terms of loss of plants and revenue, and an impact on staff if they have to be diverted from routine tasks to help deal with the outbreak
- There are also wider threats to the natural environment (e.g. beech woodland, heathland) when action is not taken promptly
- Detecting the outbreak as soon as possible, and reporting it quickly to the relevant Plant Health Authority, can help to minimise these effects

HOW?:

Whilst it should help to reduce the risk, following the guidance in these *Phytophthora* best-practice protocols does not, unfortunately, guarantee freedom from an outbreak of *Phytophthora ramorum* or *P. kernoviae*. Therefore, this protocol deals with the procedures to follow in the event of a suspected outbreak, and the action that is likely to be taken when the presence of one of these notifiable pathogens is confirmed.

Suspected outbreaks

Regular monitoring of the park or garden, and the use of a quarantine area for bought-in or donated plants, should increase the chances that any outbreak is detected before it has the opportunity to progress too far. [See [P&G5 on Risk assessment and monitoring](#) and [P&G3 on Quarantine areas](#)] If you find symptoms that you believe could be caused by *P. ramorum* or *P. kernoviae*:

- Notify the relevant Plant Health Authority immediately – this is a legal requirement [See [P&G15 on Information sources](#)]
- Cordon off the area concerned and restrict public access
- Do not handle or move the plants
- Inspect other susceptible plants on the site for symptoms
- Do not apply anti-*Phytophthora* fungicides to plants where infection is suspected

- Restrict (or, if possible, stop) the use of overhead watering on plants thought to be affected
- Provide the authorities concerned with all necessary documentation and records (including plant passport information where appropriate)

Confirmed outbreaks

The Plant Health Authority staff will take samples from affected plants to be tested for the presence of *P. ramorum* and *P. kernoviae*. Where either is confirmed, a Statutory Notice will be issued detailing the eradication and containment actions required. The Statutory Notice will give a time frame in which all of the actions must be carried out. The following actions may be required:

- Prohibition on the movement of infected plants, or parts of these plants (e.g. they must not be used for propagation or for foliage purposes)
- Destruction by burning or deep burial (at an approved landfill site) of infected plants, susceptible plants within an appropriate cordon sanitaire, and associated plant debris
- Prevention of re-growth
- Felling or pruning of infected trees, depending on the part of the tree infected and the extent of the infection
- Implementation of measures to prevent re-infection at the site. These may, for example, include a prohibition on planting susceptible plants in contaminated soil, removal or sterilisation of contaminated soil

In some situations, attempts at immediate eradication as detailed above may be deemed inappropriate (e.g. where comprehensive eradication would completely destroy the character of an historic garden). In such cases, a protocol of containment measures may be stipulated. These measures, some of which will also be applicable to sites where eradication work is in progress, are likely to include:

- A regular programme of cleaning to remove plant debris from the surface of paths and standing areas
- Repair and maintenance to the physical structures of footpaths
- Safe disposal of all waste from susceptible plants, by burning or deep burial at an approved landfill site
- Restrictions on access to contaminated areas, e.g. cordoning-off or re-routing of footpaths to avoid contaminated areas
- Hygiene measures for employees and contractors, including cleaning and disinfection of footwear and machinery before leaving the site

- Some restraint on the movement of dogs or domestic stock, e.g. dogs to be kept on short leads
- Erection of information signs to alert the public to the presence of the disease (including advice relevant to the site)
- Removal and destruction of infected plants adjacent to footpaths, and of any infected plants that are deemed to be unsafe (e.g. large shrubs and trees)
- Removal and destruction of infected plants which pose a risk to neighbouring plants (e.g. large shrubs or trees with leaf infection, particularly if other susceptible plants are in the 'drip line' below them)
- Fungicide treatment, either to reduce inoculum or to protect valuable specimens
- A regular programme of official surveillance of the site and its surroundings, to check that the disease is not increasing to levels where containment is compromised
- Additional measures will be required if the park or garden has a separate sales or production area from which plants are moved or sold. If either pathogen is confirmed in these areas, the legally required eradication and containment measures for such areas will apply [[See NR&L13 – Nurseries, retailers & landscapers best practice protocol on Outbreak situations](#)]

All staff should be made aware of the outbreak, what is required to deal with it, their role in this, and how information regarding management of the outbreak is to be communicated (both between the Plant Health Authority and the organisation, and within the organisation itself). It is important that this includes not only full-time employees, but also part-time staff and volunteers.

P&G14 PLANT PASSPORTS

AIM:

- To prevent the movement of plant material affected by *Phytophthora ramorum* into and within the European Union (EU). (N.B. Plant passporting criteria are also applied to hosts of a range of other quarantine [notifiable] organisms)

WHY?:

- Certain plant genera are 'key' hosts for *Phytophthora ramorum*. Most of the confirmed cases of the pathogen, both within the nursery trade and in outbreaks affecting parks and gardens, have been found on these hosts. The pathogen is also capable of producing large numbers of spores on the foliage of some of these hosts, increasing the risk of the infection spreading widely
- Plant passports enable checks to be made for *P. ramorum* at the place of production. They are also critical in enabling the Plant Health Authorities to trace the source of any outbreaks of the pathogen back through the supply chain

HOW?:

General information on plant passports

- Certain plants moving within and between EU states require a plant passport
- The passport must always accompany the plant (at all stages of production down to the final retailer) and must include the words 'EC Plant Passport', a country identifier (e.g. UK/EW for the United Kingdom) and a reference number
- The reference number may include RP if the plants have a replacement passport. For example, if a trader has split or mixed a batch of plants for onward movement or sale, and that batch of plants already possessed a passport, a further passport is required for onward movement of the new batches
- The passport is issued by the plant producer, who is authorised and inspected by the relevant Plant Health Authority. The producer must re-apply for authorisation each year

The plant passport provides documentary evidence that:

- The plants have been grown by a registered grower whose premises are regularly inspected and who is authorised to issue plant passports
- The plants are, to the best of the producer's knowledge, free from all quarantine pests and diseases and, where appropriate, grown in an environment which is also free from pests and diseases.
- Plants imported from outside the EU have been landed by a registered importer, inspected on arrival in the UK or in another member state (or at an approved destination)

and found to be free from quarantine pests and diseases prior to being passported for movement within the EU

Specific information on plant passports for hosts of *Phytophthora ramorum*

- The following genera of plants require plant passports in relation to *Phytophthora ramorum*: species and hybrids of *Camellia*, *Rhododendron* (except *R. simsii* (pot azalea)), *Viburnum*
- The conditions of the passport are that the material originates in areas where *P. ramorum* is not known to occur, or where there have been no signs of the pathogen at the place of production
- In cases where signs of the pathogens have been found, appropriate procedures for eradication must have been implemented

If you are in receipt of any of the above genera of plants, they must be accompanied by a plant passport.

- Inform the relevant Plant Health Authority if any of the above genera are delivered without a plant passport, or if the passport appears irregular or invalid
- Retain any plant passports for at least one year (this enables the Plant Health Authority to trace back any outbreaks)
- The Plant Health Authority can ask to see original passports – photocopies or retrospective plant passports are not acceptable. However, where it is not practical to keep the original document (e.g. it takes the form of a label stuck firmly to a plant tray), the passporting information may be copied onto a manual or computer log, provided that this is easily accessible for inspection

Further information on plant passports is given in the Defra document *Plant Health Guide to Plant Passporting and Marketing Requirements*, which can be downloaded from:

[Plant Passport.](#)

P&G15 INFORMATION SOURCES FOR *PHYTOPHTHORA RAMORUM* & *P. KERNOVIAE*

1. PUBLICATIONS

***Phytophthora ramorum*: A Practical Guide for Established Parks & Gardens, Amenity Landscape and Woodland Areas (product code PB12983)**

***Phytophthora ramorum*: A threat to our woodlands, heathlands and historic gardens**

***Phytophthora kernoviae*: A threat to our woodlands, heathlands and historic gardens**

***Phytophthora*: Don't let it destroy our environment**

These guides from the Department of Environment, Food and Rural Affairs (Defra) and The Food and Environment Research Agency (Fera) give information on the background to the problem, the biology of the pathogen, a guide to minimising the risk, and steps to take if an outbreak is suspected. There are also descriptions and photographs of the symptoms caused on several host plants.

Copies can be obtained from:

The Food and Environment Research Agency
Sand Hutton
York
YO41 1LZ

Tel: +44 (0) 1904 462000
Email: info@fera.gsi.gov.uk

2. WEBSITES

The Food and Environment Research Agency (Fera) – an executive agency of Defra.

The links below will take you to a front page for each of the pathogens. From here, there are further links to:

Distribution maps
The relevant Plant Health Order
Plant disease factsheets
Host lists
UK and EU Pest Risk Analyses (PRAs)
Key findings from UK research
Online versions of the 'Practical Guides' for *P. ramorum*, as listed under Publications, above.
Frequently asked questions

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

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

Forestry Commission

This site concentrates on the threat to trees and woodland in the UK. The links below will take you to a front page for each of the pathogens. From here, there are further links to:

- Background and frequently asked questions
- Support for owners and managers
- Country briefings
- Symptom images
- Advice to owners and operators
- Information for agents
- Outbreak map
- Phytophthora* news releases
- Guidance for Plant Health Inspectors

<http://www.forestry.gov.uk/pramorum>

<http://www.forestry.gov.uk/forestry/infd-66jlgb>

There are also links to the Forest Research arm of the Forestry Commission, the website of which contains further information.

Scottish Executive Environment & Rural Affairs Division (SEERAD)

This site provides information on the situation in Scotland. There are further links to information on:

- Legislation
- A practical guide
- Inspection and eradication
- Research
- Information sheets

<http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/plant/PlantHealth/PlantDiseases/Phytophthoras>

Department of Agriculture and Rural Development, Northern Ireland (DARDNI)

This website provides information on the situation in Northern Ireland.

<http://www.dardni.gov.uk/forests-service/index.htm>

Risk Analysis for *Phytophthora ramorum* (project RAPRA)

This is the website of a risk analysis and research programme applying across and supported by the European Union. In addition to providing information on the work and objectives for the project, the website also includes useful general information such as European host lists, European disease distribution maps, photographs of symptoms and a life-cycle diagram.

<http://rapra.csl.gov.uk/>

Royal Horticultural Society (RHS)

This site provides information for gardeners and garden staff on the pathogens, and details of relevant RHS research.

<http://apps.rhs.org.uk/advicesearch/Profile.aspx?pid=329>

Information from the USA

The websites below may be useful for further information and pictures of symptoms, as well as showing the extent of the sudden oak death problem in parts of America (native UK oak species are more resistant to *Phytophthora ramorum* than their American counterparts).

United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service:

http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/index.shtml

California Oak Mortality Task Force:

<http://www.suddenoakdeath.org/>

Oregon Department of Agriculture:

http://www.oregon.gov/ODA/CID/PLANT_HEALTH/sod_index.shtml

3. REPORTING OF SUSPECT FINDINGS OF *P. RAMORUM* OR *P. KERNOVIAE*

England and Wales

Notify the Plant Health and Seeds Inspectorate (PHSI), part of the Food and Environment Research Agency (Fera). Notify your local office, or Fera at York:

Plant Health
Room 10GA01
The Food and Environment Research Agency
Sand Hutton
YO41 1LZ
United Kingdom

Tel: +44 (0) 1904 465625

Fax: +44 (0) 1904 465628

Email: planthealth.info@fera.gsi.gov.uk

Details of local PHSI offices can be found at:

<http://www.fera.defra.gov.uk/contactUs/documents/phsiOffices0511.pdf>

Scotland

Notify the Scottish Government, Rural Payments and Inspections Directorate (RPID), Horticulture and Marketing Unit, Edinburgh:

Tel: +44 (0) 131 244 6303

Fax: +44 (0) 131 244 6449

Email: hort.marketing@scotland.gsi.gov.uk

Website: <http://www.scotland.gov.uk/Topics/farmingrural/Agriculture/plant/PlantHealth>

Northern Ireland

Notify DARDNI (Department of Agriculture and Rural Development Northern Ireland):

Quality Assurance Division
Department of Agriculture & Rural Development
Room 115
Magnet House
81–93 York Street
Belfast BT15 1AB

Tel: +44 (0) 28 9054 7106

Fax: +44 (0) 28 9054 7204

Suspected cases on trees should be reported to the Forest Service, Tel: +44 (0) 28 9052 4480.

Website: <http://www.dardni.gov.uk/plant-health-for-northern-ireland-title-page>

In **England, Wales** and **Scotland**, suspected cases on **mature trees and woodland** specifically should be notified to the Forestry Commission Plant Health Service:

Forestry Commission
Plant Health Service
Silvan House
231 Corstorphine Road
Edinburgh
EH12 7AT

Tel: +44 (0) 131 314 6414

Fax: +44 (0) 131 314 6148

Email: plant.health@forestry.gov.uk

4. DISPOSAL OF PLANT WASTE

The following organisation's websites carry information on the various methods available to dispose of or process plant waste, and/or the legislation that applies:

Environment Agency:

<http://www.environment-agency.gov.uk/business/sectors/32777.aspx>

Waste Resources Action Programme (WRAP):

<http://www.wrap.org.uk/>

Association for Organics Recycling (AfOR):

<http://www.organics-recycling.org.uk/category.php?category=991&name=Certification>

General guidance for the treatment of horticultural waste to minimise plant health risks is available in the Food and Environment Research Agency (Fera) document *Code of Practice for the Management of Agricultural and Horticultural Waste*:

<http://www.fera.defra.gov.uk/plants/publications/documents/copManagementWaste.pdf>

5. PLANT PASSPORTING INFORMATION

This is available on the Food and Environment Research Agency (Fera) website:

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

6. TESTING OF PLANTS, GROWING MEDIA, SOIL & WATER

The Fera Plant Clinic is able to test for a range of *Phytophthora* species, including *P. ramorum* & *P. kernoviae*:

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

Some other laboratories may also be able to test for *Phytophthora* spp.

7. ACCREDITATION SCHEMES FOR PRODUCERS OF ORNAMENTAL PLANTS

British Ornamental Plant Producers (BOPP):

<http://www.bopp.org.uk/index.html>

Linking Environment and Farming (LEAF):

<http://www.leafuk.org/leaf/home.eb>

GLOBALG.A.P. Flowers and Ornamentals Standard:

http://www.globalgap.org/cms/front_content.php?idart=143&idcat=48&lang=1&client=1

Each of these websites gives details of the aspects of production that are covered within the accreditation scheme, and the criteria examined during the independent auditing process. Some of the BOPP certification schemes also satisfy the criteria for LEAF and GLOBALG.A.P.

P&G16 USE OF *PHYTOPHTHORA* LATERAL FLOW DEVICES (LFDs)

BACKGROUND

What are they?

LFDs use antibodies to detect antigens (proteins) using technology similar to that employed in home pregnancy testing kits. The antigens are produced by all species of *Phytophthora*, including *P. ramorum* and *P. kernoviae*.

How can they help us?

Symptoms of diseases caused by *Phytophthora* species can often be confused with other diseases, insect damage, over- or under-watering etc. In these situations, LFDs can be used to confirm if the symptoms are caused by a *Phytophthora* species. The devices have been used extensively to test for *Phytophthora* diseases both in gardens and in plant sales areas. LFDs are also available for a range of other fungal, bacterial and viral diseases.

How specific are they?

The kits are known to react to at least 13 species of *Phytophthora* including *P. ramorum*, *P. kernoviae*, *P. fragariae*, *P. cactorum* and *P. infestans*, so are useful for general *Phytophthora* screening. They do not cross-react with related organisms such as *Pythium* spp. or downy mildews.

How sensitive are they?

The kits are very sensitive and can detect just a few milligrams of infected rhododendron leaf tissue (equivalent to a few square millimetres, permitting detection in leaf tissue which is less than 1% infected by *P. ramorum*).

What can and can't I test?

Leaves, stems, roots can be tested, but the kits are not suitable for testing soil or water. They have been used successfully to test bleeding bark cankers.

Where can I buy them?

The kits are commercially available from Forsite Diagnostics Ltd, Sand Hutton, York YO41 1LZ

Tel: +44 (0) 1904 462660

Email: pocketdiagnostic@forsitediagnostics.com

Website: <http://www.forsitediagnostics.com>

INSTRUCTIONS FOR USE – EXAMPLE *P. ramorum/kernoviae*

In order to prevent any cross-contamination when breaking up the tissue prior to placing in the extraction bottle, either wear disposable gloves or wash hands with a proprietary alcohol gel between samples.

Leaves: Take approx. a 1–2 cm square of diseased tissue (Figure 1a). Fold up the piece of tissue and crush to help break down the sample (Figure 2a).

Stems: Shave-off about 5 small (ca. 1 cm long) slivers of the outer tissue from a necrotic area. Try to get tissue from the leading edge of infection (the boundary between brown and green) because the fungus is most active there. Crush if possible (Figures 1b and 2b). Clean knife before re-use.

Place the sample in the extraction bottle (Figure 3a) and shake vigorously for at 60 seconds (Figure 3b). Longer may be needed for woody tissue.

With the pipette, draw up the extraction solution (there should be a slight green to brown coloration if the extraction has been successful, Figure 4a).

Place 2–3 drops in the sample well (Figure 4b). If liquid does not start to flow across the membrane after 30 seconds (Figure 5a), add one or two further drops until fluid flows across the membrane. Do not use more than 4 drops as this will flood the membrane resulting in an invalid test.

Leave for 2–3 minutes.

Check to see whether a blue line has appeared at 'C' (control), (Figures 6a and 6b)

Check to see whether a blue line has appeared at 'T' (test), (Figures 6a and 6b)

You may check for lines up to 20 minutes, but results after this time should not be considered.

In cold weather, the devices may take longer to develop. If the kits are very cold (e.g. stored in a car overnight), it is advisable to bring them back up to room temperature.

If the material appears dry or is very woody, after the initial 60 seconds of shaking you can leave the sample in the bottle to soak to aid extraction for up to 1 hour before testing.

INTERPRETATION OF RESULTS

Control line is not blue – test invalid re-test with the same extract but a new LFD.

Control line is blue – test valid

Test line is blue within 10 minutes (Figure 6b – upper LFD [A]) – **Positive** for *Phytophthora* spp.

Test line is not blue within 20 minutes (Figure 6b – lower LFD [B]) – **Negative** for *Phytophthora* spp.

HEALTH & SAFETY

Risk to user: The extraction buffer contains sodium azide, a detergent (Tween 20) and polyvinylpyrrolidone (PVP). The concentrations are such that any risks associated with the product are considered very low. However, ingestion of the buffer should be avoided, and care should be taken to avoid contact with skin or eyes. Should contact occur, rinse with copious amounts of water.

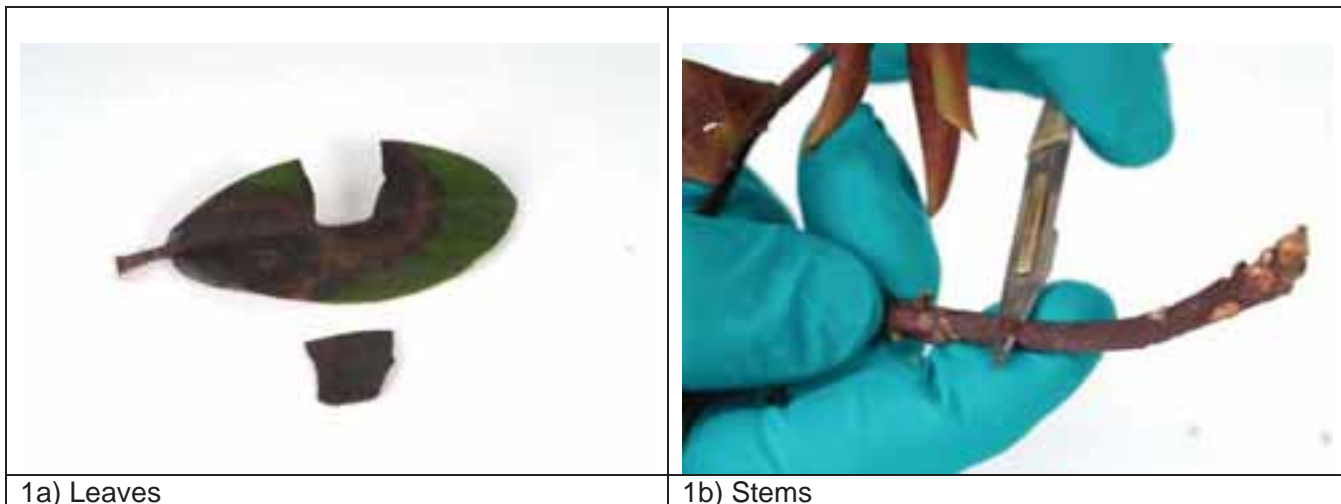
STORAGE

Store at ambient conditions. Do not place in the fridge or freezer. The kits have an expiry date on the foil packet. Once the foil packet has been opened, use the kits as quickly as possible (within several days). Where possible, seal opened foils with sticky tape until remaining LFD is

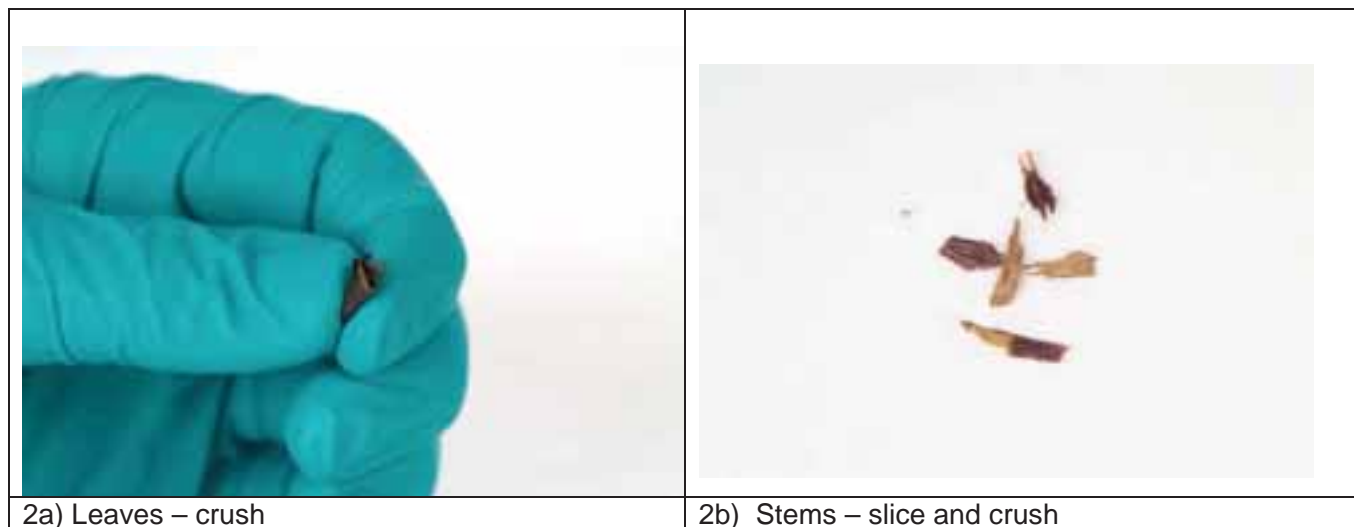
required.

SAMPLING AND TESTING PROCEDURE



Select a sample




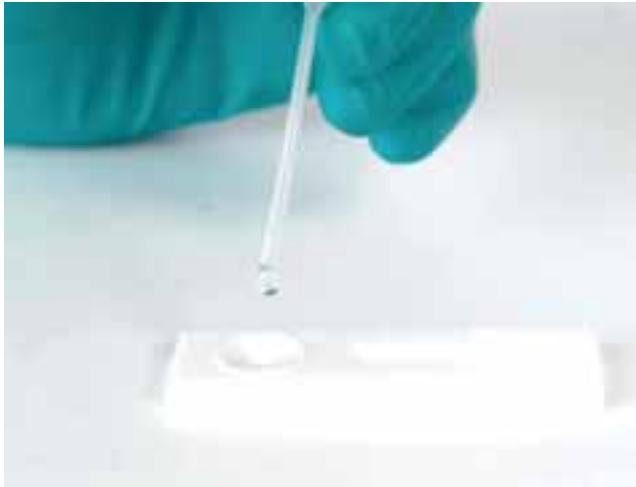
Break down sample prior to placing in the extraction bottle



Place sample in extraction bottle and shake vigorously for 60 seconds

	
3a) Place in bottle	3b) Shake vigorously for 60 seconds

Draw up extraction fluid and pipette onto LFD

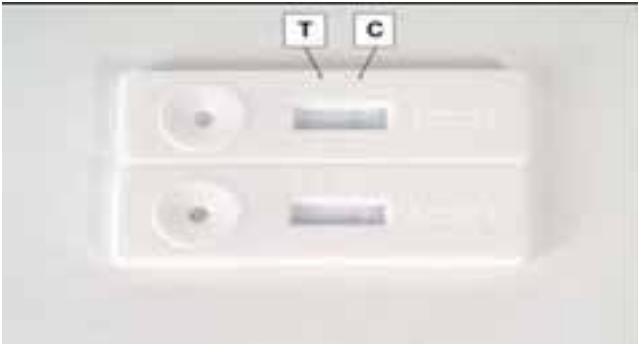
	
4a) Check to see if the extraction liquid is discoloured	4b) Pipette 2–3 drops onto sample well

Check to see if the extraction fluid is running across the membrane

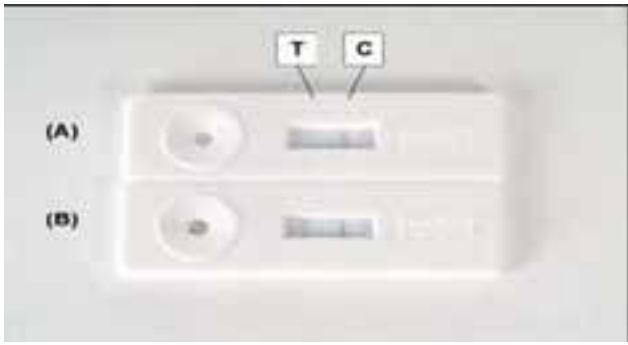


5a) Pale blue fluid runs across membrane

Read after 2–5 minutes



6a) Test kit after 30 seconds – faint control lines ('C') appearing; no test lines ('T') appearing



6b) Test kit after 3 minutes: A) Test valid, sample negative; B) Test valid, sample positive

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Appendix 2

List of full URLs for hyperlinks

For printed versions the following are the full URLs for the links used within this document:

P&G1 SOURCING PLANTS

Defra/Fera *P. ramorum* host list

<http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/phytophthora/documents/pRamorHost.pdf>

Defra/Fera *P. kernoviae* host list

<http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/phytophthora/documents/pKernoviaHost.pdf>

P&G4 DESIGN & LAYOUT

Outdoor Access Scotland

<http://www.outdooraccess-scotland.com/>

P&G5 RISK ASSESSMENT AND MONITORING

FC *P. Ramorum* Distribution

<http://www.forestry.gov.uk/forestry/infd-86ajqa>

Fera *P. Ramorum* distribution

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

Fera *P. Kernoviae* distribution

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

Defra / Fera *P. ramorum* host list

<http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/phytophthora/documents/pRamorHost.pdf>

Defra / Fera *P. kernoviae* host list

<http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/phytophthora/documents/pKernoviaHost.pdf>

Fera Information

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

FC information

<http://www.forestry.gov.uk/pramor>

Forsite

<http://www.forsitediagnostics.com/>

P&G6 HUSBANDRY

Forestry Commission

<http://www.forestry.gov.uk/fr/INFD-8f7BU3>

P&G9 DISPOSAL OF PLANT WASTE

EPPO PM 3/66

<http://archives.eppo.org/EPPOStandards/procedures.htm>

Environment Agency 117109 (Exemption T23)

<http://www.environment-agency.gov.uk/business/sectors/117109.aspx>

Environment Agency 116324 (Exemption U11)

<http://www.environment-agency.gov.uk/business/topics/permitting/116324.aspx>

Environment Agency 117125 (Exemption D6)

<http://www.environment-agency.gov.uk/business/sectors/117125.aspx>

Environment Agency 117127 (Exemption D7)

<http://www.environment-agency.gov.uk/business/topics/permitting/117127.aspx>

Waste Directory

<http://www.wastedirectory.org.uk/>

Environment Agency 89988

<http://www.environment-agency.gov.uk/business/regulation/89988.aspx>

Code of Practice

<http://www.fera.defra.gov.uk/plants/publications/documents/copManagementWaste.pdf>

P&G10 STAFF TRAINING

Defra / Fera *P. ramorum* host list

<http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/phytophthora/documents/pRamorHost.pdf>

Defra / Fera *P. kernoviae* host list

<http://www.fera.defra.gov.uk/plants/plantHealth/pestsDiseases/phytophthora/documents/pKernoviaHost.pdf>

P&G11 CUSTOMERS AND VISITORS

Fera general information

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

Phytophthora – Don't Let It Destroy Our Environment

<http://www.fera.defra.gov.uk/plants/publications/documents/phytophthoraPublicLeaflet.pdf>

Outdoor Access Scotland

<http://www.outdooraccess-scotland.com/>

P&G14 PLANT PASSPORTS

Plant Passport

<http://www.fera.defra.gov.uk/plants/publications/documents/pass.pdf>

TURNING OVER A CLEAN LEAF

How to protect your garden from pest and disease invaders



- 1 Plants coming in:** this is the way that most pests and disease-spreading pathogens enter a garden!
 - What can you do?**
 - Use reputable suppliers who have been 'checked out'
 - Source locally if possible
 - Avoid cheap imports and semi-mature specimen trees from abroad
- 2 Plants on arrival need careful inspection. Remember to:**
 - Check paperwork for compliance with purchase order form and plant passport if needed (eg EC Plant Passport UK:EW 12345)
 - Only accept delivery if you are sure that the plants are healthy
- 3 Quarantine areas** should be isolated from the main garden and the public.
 - What more can you do?**
 - Restrict access to the area
 - Be scrupulous about hygiene
 - Use dedicated tools
 - Hold new arrivals for 2-6 weeks and monitor frequently
- 4 Day-to-day hygiene:** many pests and pathogens are carried on boots!
 - It's important to:**
 - Wash all soil and plant material from footwear and disinfect them
 - Clean and disinfect tools and machinery
 - 5 Basic path maintenance** can help too.
 - How?**
 - Surfacing and leveling avoids puddles
 - Clearing and cleaning removes leaves and plant debris that can harbour pests and pathogens
- 6 Good plant husbandry** also matters.
 - What can you do?**
 - Use the right plant in the right place
 - Mutch when planting perennial ornamentals to prevent soil establishing onto foliage
 - Use space to help ventilation and reduce humidity
 - Manage plants to encourage vigorous, healthy growth
 - Prevent plants such as Rhododendron portulacum from choking the garden

- 7 Clear information** helps keep visitors informed and aware.
 - Why put up a notice?**
 - To inform visitors of serious outbreaks
 - To restrict access to ground under repair
 - To suggest responsible behaviour eg clean shoes, not taking cuttings, keeping to paths, dogs on leads etc
- 8 Irrigation water** should be clean and free from plant pathogens.
 - How can you ensure this?**
 - When using recycled water, eg collected off roofs, try to clean it before use (and filtration works well)
 - Cover water tanks to prevent leaves blowing in
 - Regularly test water to check for pathogens
- 9 Organic waste** can harbour pests and pathogens.
 - What should be done with it?**
 - All dried plants, prunings, fallen leaves etc should be collected and disposed of safely
 - Composting is the best way, as it kills most pests and pathogens
 - Or you could collect waste in a covered skip for removal to an approved landfill site
 - Small amounts can be burnt where they fit
- 10 Plant collections** know what you've got.
 - What can you do?**
 - Make a record of the plants in the garden
 - Develop a management plan to conserve important plants
 - Propagate important plants through the Plant Conservation Programme
- 11 Regular monitoring** of the health of your plants lets you spot problems early and take prompt remedial action.
 - What can you do?**
 - Familiarise yourselves with the main pests and diseases of plants in your garden
 - Get problems identified
 - Report all suspicious symptoms to your Garden Adviser
 - Notify suspect findings of quarantine pest and diseases to Plant Health authorities

