These guidelines are available as a hard-copy A5 booklet at £2.50 per copy, from Judy Cheney, PlantNetwork Administrator, c/o University Computing Service, New Museums Site, Pembroke Street, Cambridge CB2 3QH, UK
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Or as this downloadable pdf document at::

http://www.plantnetwork.org/downloads/planthealth.pdf

Guidelines on Legislation, Import Practices and Plant Quarantine for Botanic Gardens and Kindred Institutions.
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Edited by Judith Cheney
Published by PlantNetwork 2006.

PlantNetwork is grateful to the John Spedan Lewis Foundation for funding the publication and distribution of this booklet.

Guidelines on Legislation, Import Practices and Plant Quarantine for Botanic Gardens and Kindred Institutions

compiled by

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PlantNetwork
The Plant Collections Network of Britain & Ireland

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Preface

In July 2004, PlantNet held a workshop, for staff in botanic and heritage gardens, at the Eden Project: *Foreign Bugs: Managing Pests and Diseases in a World of Increasing Imports* (see *PlantNetwork Newsletter* 25, p.12). After the meeting, there were calls from several organisations for guidance on complying with international legislation and implementing quarantine and import procedures. The Plant Health Officers Helen Long (then at the Royal Botanic Gardens Kew), Fiona Inches (Royal Botanic Garden Edinburgh) and Katie Treseder (Eden Project) agreed to pool their collective experience and produce a set of guidelines that could be adopted, in whole or in part, by these institutions. In 2005, the Central Science Laboratory ran a training day for PlantNetwork on *Reducing Risk when Importing Exotic Plants into Collections* (see p.40).

These guidelines are in no way meant to be prescriptive: it is recognised that different institutions will have differing needs, roles, responsibilities and resources, in terms of staff, facilities and budgets. It is important to emphasise that, for the provision of effective frontline interception measures, it is not essential to have 'all-singing, all-dancing' quarantine facilities. Therefore, the guidelines are intended to form a resource to give an overview that may help gardens and organisations to comply with relevant legislation and that can be adapted to raise the profile and standards of plant health provision within individual organisations. We have not attempted to provide an exhaustive review of all the regulations pertaining to different groups of plants or types of material, as regulations are often subject to change; neither do we endorse any products that may be mentioned in this guide; they should always be used in accordance with the manufacturer's instructions.

We have included a list of published reference sources and websites, compiled by Alistair Griffiths, which can be consulted for more detailed information.

We are grateful to the following people for helpful comments and additions: Madeleine Groves and Kate Davis of the Conventions & Policy Section, Royal Botanic Gardens Kew; Guy Nettleton and Chris Furk at the Plant Health and Seeds Inspectorate and colleagues at the Central Science Laboratory; and Alistair Griffiths at the Eden Project. Our thanks to them all for their help and advice.

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November 2006

1 Legislation

Essentially, there are three main types of legislation to consider when importing or exporting plant material:

- plant health legislation
- *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES)
- *Convention on Biological Diversity* (CBD).

Plant health legislation and CITES regulations are enforceable by law, and institutions must comply with them. The CBD, while not yet legally enforced at border controls, has been ratified by the UK Government, and, as a result, institutions should ensure that they act in a manner consistent with the letter and spirit of the Convention.

1.1 Plant health import and export legislation

To guard against the spread of damaging pests and diseases, the EC Plant Health Directive (2000/29/EC) (as amended) sets out regulations on the import and movement of plants and plant products. Commission decision 95/44/EC (as amended) sets out the conditions under which certain harmful organisms, plants, plant products and other material may be introduced into and moved within the European Community (EC) for trial or scientific purposes and for work on varietal selection. Directive 2000/29/EC is transposed in the UK by: the **Plant Health** (England) **Order** 2005 (as amended), the Plant Health (Wales) Order 2006, the Plant Health (Scotland) Order 2005, the Plant Health (Northern Ireland) Order 2006 and the Plant Health (Forestry) Order 2005 (in respect of forestry pests). Commission decision 95/44/EC is incorporated into UK law by the various Plant Health Orders (see p.42 for web versions). The Department for Environment, Food and Rural Affairs (Defra) is responsible for implementing the UK Government's responsibility to comply with international plant health legislation in England and (on behalf of the Welsh Assembly) in Wales.

The Plant Health Order totally prohibits the import of some genera and of certain types of material from particular species. The Order also imposes special restrictions, including movement conditions, on a number of crop or forestry species, to protect the UK agricultural, forestry and horticultural industries from particular non-indigenous pests and diseases. The Order requires that you must notify an inspector of the presence of any plant pest that is not normally present in Great Britain and likely to be injurious to plants in Great Britain, or is on the list of pests that are banned from the European Community.

The Plant Health Division of Defra oversees policy responsibilities in England and Wales for plant quarantine, import and export arrangements, and plant and seed certification, which is implemented via the Plant Health and Seeds Inspectorate (PHSI) for all plants, including commercial nursery stock, private imports and freight shipments, e.g. cut flowers and fruit and vegetable produce. Plant Health Division is supported by the Central Science Laboratory in York (see p.40), which conducts scientific research and provides scientific and technical advice.

The Forestry Commission oversees policy implementation and plant health responsibilities in relation to forestry, woodlands, timber and some amenity trees, through its regional headquarters in England, Scotland and Wales. The Forestry Commission is supported by its own network of regional offices plus two main research stations, at Alice Holt in Surrey and the Northern Research Station near Edinburgh (see p.41).

Since devolution, the Scottish Executive Environment and Rural Affairs Department (SEERAD), which is Defra's equivalent in Scotland, oversees plant health policy responsibilities and plant and seed certification (see p.38). It is supported by the Scottish Agricultural Science Agency (SASA), which provides technical and scientific advice (see p.38). In Northern Ireland, the Plant Health Division of the Department of Agriculture and Rural Development (DARD) has overall responsibility for plant protection (see p.38).

The Plant Health Order is enforced at international borders by HM Revenue & Customs and by the national network of the PHSI in England and Wales. The PHSI regional offices and contact numbers for local inspectors are listed on the Defra Plant Health website: (see

p.40). For details of inspectors for Scotland and Northern Ireland, see the websites of SEERAD and DARD, respectively (see p.38).

A **phytosanitary certificate** is required for importation of many types of plant, plant product and seeds from third countries outside the EC. There are concessions for travellers importing limited amounts of plant material as personal baggage, but these are not applicable to postal imports, or to material intended for commercial or professional use. For more details on travellers' concessions, see the Defra Plant Health website (see p.40).

As a general rule, the import of soil, as such, is prohibited from third countries outside the EC, except when soil is brought in for research purposes under a special **import licence**. Inert, unused or sterile materials, such as coir, perlite, pure peat, sphagnum moss or damp newspaper, can be used to keep roots alive in transit as alternatives. Where it is essential for survival of the plants in transit, small quantities of soil or growing media attached to plants are permitted, but the more soil involved the greater is the risk of importing associated pests and diseases.

Although there is free trade and therefore free movement of plant material between EC member states, a **plant passport** is required for movement of some plants within and between member states. Additional conditions may be applied for particular species to enter what are termed 'protected zones', because of the risks that associated pests or diseases can pose to the food industry, forestry, horticulture and the environment in general. Records of plant passports and associated documentation must be retained for tracking and trace-back purposes in the event of an outbreak. The list of plant material for which plant passports are required has recently increased to take into account new disease threats, such as *Phytophthora ramorum* (sudden oak death or ramorum blight). Botanical collections often fall outside the remit of the plant passport scheme, as they are perceived as non-commercial 'end users'. However, if you intend to buy material for growing on, bulking up and sale to other commercial nurseries, or if you have an area selling plants to members of the public, you should consider becoming registered on the scheme. Further details of the plant passport scheme can be found on the Defra Plant Health website (see p.40).

It is a legal requirement that all planting material received from outside the European Union (EU) is inspected on, or shortly after, arrival, even though it has been covered by a phytosanitary certificate prior to export. This is because pests and diseases can develop while in transit, so certificates cannot be totally relied upon. It is wise to isolate non-EU material from your other collections for a period (e.g. 3 months minimum) after it has been inspected, to be sure that it is free from pests and diseases, because some organisms have life cycles that may not be evident during inspection just before and after entry. Following Government consultation, charges have been introduced for plant import inspections, and importers are required to register with Defra in order to process Customs clearance of goods. For details of the changes to the import regime, see the *Plant Health Guide for Importers* on the Defra website (p.41).

Changes due to be introduced in 2007 will require all importers of controlled goods from third countries, i.e. those requiring a phytosanitary certificate, to notify PHSI in advance of their intention to import such goods. This change will be enforced from June 2007. This is in order to comply with changes to the EU Directive that specifies that 100% inspection must be carried out on regulated or controlled goods such as plants and plant produce. The system allowing importers to pre-notify will be online on the Defra website late in 2006. In future, it will be a requirement that goods clearing through the Customs process have been inspected by PHSI before clearance is granted. The only exceptions will be for importers who register their premises with PHSI under the Customs Freight Simplified Procedures, to enable them to transit goods inland while still under Customs control and then have the goods checked on their premises by their local PHSI. However, this is still under negotiation between Defra and HM Revenue & Customs. Regular updates are provided on the legislation and import/export sections of the Defra Plant Health website (see pp.40–41).

If your institution wishes to import direct wild-source material, this may not be granted a phytosanitary certificate by the exporting country, since the authorities cannot guarantee the conditions under which the material has been produced, nor the range of organisms to which it may have been exposed. You can apply to Defra Plant Health Division (or to SEERAD or DARD) for a **plant import licence**

to allow you to bring in certain types of restricted or prohibited material (for research purposes only), subject to an assessment of your site and isolation facilities and compliance with certain licence conditions. The licence has to be renewed annually.

Import regulations of third countries will apply if you are sending plant material outside the EU, e.g. to researchers, or exchanging material with other botanical collections. Outgoing living plant and seed material must be covered by a phytosanitary certificate. In some cases, depending on the legislation of the receiving country, a plant import permit may also be required from their national plant protection organisation prior to shipping, which will also describe any necessary pre-export treatments or tests. Your local PHSI can provide advice on regulations in receiving countries and help you to comply with any pre-export tests that may be required to establish that plants are free from particular pests, such as potato cyst nematodes; or to conduct annual site surveys to declare your site free from particular diseases, e.g. *Phytophthora ramorum*, for compliance with restrictions on certain species. Charges are made for the inspection of material and issue of phytosanitary certificates, but you may be eligible for concessionary rates if the costs of inspections fall below certain limits each year and they are for non-commercial purposes.

1.2 *Convention on International Trade in Endangered Species of Wild Fauna and Flora*

The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) regulates the trade in approximately 25 000 species of plant, through a permit system. Species covered by the Convention are listed in three categories, called Appendices, according to the level of threat that international trade poses to the survival of the species in the wild. Within the EU, these Appendices are replaced by equivalent Annexes under the EU Wildlife Trade Regulations. CITES regulations apply to whole plants and to parts of plants, seeds, pollen, derivatives and extracts, and herbarium specimens. Species may be annotated in the listings to show exactly which parts (if any) are exempt from controls.

Many of the 'high-impact' plants that attract visitors to our gardens are listed on CITES, e.g. orchids, cacti, cycads and carnivorous plants, but also covered are many other species with traditional medicinal, timber or other uses. Species may be listed at a family level, e.g. all Orchidaceae or all Cactaceae; or individual genera, species, or even particularly threatened populations of a species from a specified country may be listed.

Over 160 countries are now parties to CITES and they meet every 2 years at a Conference of the Parties (COP) to discuss and implement changes to the Convention. CITES is overseen by a secretariat based in Geneva. In between the meetings of each COP, committees such as the Plants Committee meet to discuss aspects of scientific advice and implementation and work on proposals for the addition or deletion of species listed in the Convention. The UK, as an EU member state, is a party to CITES under the EU Wildlife Trade Regulations.

Each party to the Convention has to appoint a management authority with responsibility for issuing permits. The management authority for the UK is the Global Wildlife Division of Defra. Each management authority is supported by a scientific authority that provides independent scientific advice on the status of the species when a permit is sought. The UK management authority is supported by the Joint Nature Conservation Committee (JNCC) as the scientific authority for animals and the Royal Botanic Gardens Kew as the scientific authority for plants. The scientific authorities are not able to answer queries or provide advice in relation to permit applications. The management authority can provide information and advice to those wanting to import regulated species, and charges are made for issuing permits. In the UK, the scale of charges for permits is currently under review.

For the purposes of the Convention, any movement of a species across international borders is considered as trade, whether it is for commercial or non-commercial purposes. Trade is still allowed, subject to permits which are issued when the relevant authorities are satisfied that the proposed trade will not be detrimental to the survival of a particular species in the wild. Due to the European single market and the absence of internal border controls, CITES provisions are applied uniformly in the EC through the EU Wildlife

Trade Regulations. In some respects, these regulations are stricter than CITES itself; for instance, they include certain non-CITES species for which trade is being monitored and they have stricter welfare requirements for living animals. **The crucial difference for importers of most CITES-listed species into the EU is the requirement to obtain not only a CITES export permit from the country of export, but also a CITES import permit from the country of import. Both sets of documents have to travel with the material.** Within the UK, the management authority requires prior sight of the export permit (often a photocopy will suffice) before they will issue the equivalent import permit. Once CITES-regulated material has been legally imported into an EU member state, it can then be moved freely and traded between other member states without the need for permits. However, it is advisable to retain permits as proof of legal ownership and import.

Under the EU Wildlife Trade Regulations, parties in the EU have adopted stricter measures than the basic Convention, and so some species not listed in basic CITES are included on the EU CITES Annexes. Institutions operating within the EU should always consult the EU Annexes rather than the basic CITES Appendices.

Annex A includes all species listed in Appendix I of CITES, plus certain other species which look the same and so pose difficulties for enforcement, or need a similar level of protection, or for the effective protection of rare taxa within the same genus. Trade in wild-taken specimens of this category is prohibited for commercial purposes. Trade in wild-taken specimens for non-commercial purposes and in artificially propagated specimens is allowed, subject to permits.

Annex B includes all the species listed in Appendix II of CITES, plus certain other species included on a 'look-alike' basis, or because the level of trade may not be sustainable for the survival of the species or local populations, or because they pose an ecological threat to indigenous species. Trade in wild-taken and artificially propagated specimens is allowed for commercial and non-commercial purposes, subject to permits.

Annex C includes all the species listed in Appendix III of CITES. Wild-taken and artificially propagated specimens can be traded for commercial and non-commercial purposes, subject to permits.

Annex D includes non-CITES species not listed in Annexes A to C, but which are being imported into the EC in such numbers as to warrant monitoring. An Import Notification form must be completed at the time of import.

Botanic gardens and scientific institutions can apply to their management authority to become registered scientific institutions. This enables them to exchange CITES-regulated specimens with other registered institutions outside the EU, via a simple official CITES label system and negates the need to apply for CITES import and export permits. This scheme can only be used if both parties in the exchange are registered and it can only be used to exchange professionally curated collections for non-commercial purposes which are already held by an institution. Registered scientific institutions are listed by country on the website of the CITES Secretariat (see p.38), but you can also encourage new gardens to become registered by their CITES management authority, to facilitate research and exchange of material, following a straightforward assessment procedure.

CITES is enforced at international border controls in the UK by HM Revenue & Customs and within the UK by the police. On entering or leaving a country, **always carry CITES-regulated material through the Red Channel and make sure you get your CITES permits stamped by Customs to validate them.** Shipments with missing, incorrect or fraudulent documentation can be detained for inspection or seized. Following seizure, shipments may be confiscated and legal proceedings brought against importers, which can result in large fines or prison sentences. For further information on CITES, see the websites listed on pp.38–39.

1.3 *Convention on Biological Diversity*

The *Convention on Biological Diversity* (CBD) has three principal objectives: the conservation of biological diversity, the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. In contrast to CITES, which is very specific and species-oriented and has certain exemptions for artificially propagated plants, the CBD has a very broad scope, takes an ecosystem approach and is more concerned

with *in situ* conservation, sustainable use and ethical benefit-sharing with countries of origin.

The CBD gives countries of origin sovereign rights over their biological resources. National governments have the authority to control access to their genetic resources. This is often done by issuing permits to enable researchers and scientists to gain access to wild plants and to export them, but the exact procedures and permissions required differ from country to country. This means that if your organisation has an active fieldwork programme where natural-source materials are to be collected, you will need to allow sufficient time to contact and negotiate research, collecting and export permits with government departments, private landowners and local communities *before* you set off on your trip! This can take months, so think ahead. Developing an organisational CBD policy can also go a long way to reassuring governments and potential in-country partners that you are trustworthy. Remember: research, collecting and export permits are totally separate from CITES permits or phytosanitary certificates.

Each country that has ratified the CBD has appointed a national focal point to oversee implementation of the Convention within their own country; they are listed on the CBD Secretariat website (see p.39). The national focal points are intended to be a source of advice on the work being carried out at a country level. The UK National Focal Point is the Wildlife & Countryside division of Defra. National focal points may be able to provide advice on procedures for obtaining permits within individual countries, but this is an evolving process and some countries are further along than others. Working with local counterparts, such as botanic gardens or other scientific institutions, often facilitates the permit application process.

The CBD affects how botanic gardens obtain their material, i.e. it ensures that the material is legally collected and exported with the prior informed consent of the country of origin. Terms and conditions agreed at the time of collection have to be passed on to other gardens or researchers who may work on the material, which is why more and more botanic gardens are developing material transfer (or supply) agreements (MTAs) for the exchange of their material. If you would like to use the material in new ways other than as agreed at the time of collection and set out in your permit or agreement, you will need to get new prior informed consent, e.g. if you first collected a plant for taxonomic research, but would now like to develop it for commercial horticulture.

The benefits to be shared from using genetic resources may be financial or non-financial. Sharing collecting trips with an in-country partner institution; joint authorship of publications and sharing copies of research results, species and technical information; and providing help with in-country training are all established ways for scientific institutions to share non-financial benefits. In other words, benefits need not only be financial and the result of commercialisation of resources by pharmaceutical or horticultural companies. Botanic gardens and scientific institutions are generally non-commercial entities, but it is worth remembering that the research you conduct may be used by others for commercial purposes, e.g. plants may be screened for active compounds and patents lodged. Again, new uses require new prior informed consent.

If your institution is involved in breeding work or the introduction of new horticulturally interesting forms of wild-source plants, you should consider the implications in the light of the CBD. Although the CBD is now over 10 years old, it is still an evolving convention and it takes time for its basic tenets to be translated into practical implementation. As a result, institutions have only recently started to re-examine areas of their work that they previously felt had become prohibited by the complexities of the legislation. The CBD does not prohibit your work, but it does mean that the work has to be ethically sound. Small-scale commercialisation projects may require some lengthy and creative negotiation with the source countries, and serious thought as to what form of monetary or other benefits may be generated, and how and with whom these can be shared in the source country. This can take up significant staff time and resources, but can generate much goodwill and improve the profile of your organisation.

For more information, see *The CBD for Botanists: An introduction to the Convention on Biological diversity for people working with botanical collections* (Williams, Davis & Cheyne; see p.37 for 2003 publication and p.39 for 2006 online version).

2 Import Practices

2.1 Considerations when sourcing material

Many institutions face the challenge of attracting new or repeat visitors to their gardens to generate revenue. It is increasingly commonplace for this to be accomplished through special events, festivals or refurbishments of public collections. This can exert considerable financial pressures, as well as pressures on timing to meet programme deadlines.

Always consider carefully what type of material you want and really need to source. Certain types of material imported from outside the EU for special events and festivals will need to be brought in well in advance to satisfy post-entry quarantine requirements, e.g. bonsai; or it may only be possible to import the material in a dormant state, e.g. plants of *Rosa*. Adequate planning can help to reduce the risk and make sure that sufficient time is scheduled into work programmes.

Check whether the taxa are listed as known hosts for certain pests and diseases or are prohibited under Plant Health Orders (see pp.7 and 42). Are all stages of growth prohibited or just certain types of material, e.g. plants, cut branches? If you are unsure whether material is prohibited, contact your local PHSI for advice.

Are the species known to be invasive or regarded as pernicious weeds? If so, can you take steps to ensure they will be contained at your institution, or could other species be used instead? Defra launched its voluntary *Horticultural Code of Practice* in 2005 to help prevent the introduction and spread of invasive species (see p.42). It is worth remembering that, historically, botanical collections have been a major factor in the introduction of invasive species around the world!

Where are you sourcing material from? Import of some materials prohibited under Plant Health Orders are only prohibited from certain countries where particular pests or diseases are known to occur. Are there suitable UK sources locally or within the EU that could be used instead? Location of sources should be considered not only in the context of pest and disease risks but also from the perspective of shipping costs and sustainability, in much the same way as ‘food miles’.

Timing: materials originating from outside the EU should be kept separate from existing collections for a suitable period after arrival to be confident of their cleanliness, so allow sufficient time for this when planning imports. However, in the recent experience of many of the large UK botanical collections, significant risks from non-indigenous pests and diseases (e.g. *Bemisia tabaci*) are presented by and found on commercially produced material of EU origin and on material from other UK and EU botanical and private collections.

Wild versus cultivated origin: you may not be able to obtain a phytosanitary certificate for wild-source material. Such material has generally been exposed to a wider range of pests and diseases than has material of cultivated origin, and it may not have been produced under controlled conditions. Applying for a plant import licence for importing natural-source expedition material can take several months; and, before such a licence is granted, you may need to improve your on-site facilities to ensure effective containment.

Whole plants can harbour a wide range of pests, diseases and viruses on all parts of the plant. Do you have sufficient time to grow material from seed or other propagating material instead?

Root-balled plants and any associated soil or growing media may carry soil-borne pests, such as nematodes or flatworms, and pathogenic fungi, such as *Phytophthora* species. Roots of plants from non-EU countries should always have been washed clean before the plants are exported to the UK.

Whenever possible, dormant organs such as tubers should be brought into growth in isolation to establish that they are free from pests, diseases and viruses. This is vital for material originating from outside the EU. Often, symptoms only emerge several months into the isolation process, once material is in active growth.

Trees and large woody plants may be infested by wood-boring beetles and other cryptic pests, which often have long life cycles and may not be evident for several months, or even years, after arrival.

Large specimens can be difficult to examine, and to contain and isolate on arrival. If problems are found, treatment of large specimens is often difficult.

Cut flowers can harbour non-indigenous insect pests, such as aphids, leaf miners, whiteflies and thrips, even though the flowers may have been treated or fumigated before export. Random sampling of bunches and close examination is advisable on delivery. Consider carefully where they are to be prepared and displayed, to minimise the risks of transferring pests to established collections or display houses.

Fruits and produce can carry insect and invertebrate pests. Check them carefully on arrival for signs of physical insect damage or diseases. Watch out for those non-indigenous fruit flies!

Timber, wooden packing material (dunnage) and stored materials can harbour a range of borers and other beetles, e.g. Asian longhorn beetle, which is a notifiable pest.

Build relationships with good and reliable suppliers, seek recommendations and ask questions. Is the supplier regarded as a source of good quality legally obtained material? If you have doubts about where a particular supplier obtained a newly named species or how it conducts its business, consider carefully whether you should be dealing with that supplier, as it could damage the reputation of your organisation.

If possible, conduct nursery visits to your suppliers in person, to check the quality of material and ask questions. Have they had pest problems with their wholesale suppliers, or what are their pest management and treatment programmes like? Do they use fungicides as a routine treatment? This could lead to suppression of disease symptoms that only become evident weeks after the plants have been imported.

Plant health standards for exports vary in different source countries – unfortunately, in some countries corruption may mean that the phytosanitary certificate is not worth the paper it was written on! Certificates cannot be relied upon as a cast-iron guarantee that plants are free from pests or disease, so it is always worth holding material received with a phytosanitary certificate for a period after arrival, to be on the safe side.

Consider how long the shipment will spend in transit. Length of time in transit equates to the length of time for pests and diseases to hatch or develop.

As an institutional practice, develop good procedures for inspecting all consignments on delivery and check carefully for pest and disease symptoms, as well as matching goods to invoices. If, for any reason, you are not satisfied with the shipment, don't sign for it! As far as site demands will allow, aim to conduct inspections in an isolated or contained area away from other collections. This allows for material to be isolated and pests to be contained immediately if a problem is found. In the worst-case scenario, if a notifiable pest was discovered and quarantine or treatment imposed, how would this affect operational needs for the area?

2.2 Risk assessment of intended imports

The following risk-assessment procedure was developed by staff at the Eden Project, with the aim of protecting their main collections from unwanted pests and diseases. In a world of limited resources and time, it is important to be as pragmatic as possible. The risk assessment is a way of highlighting in advance any possible problems attached to a consignment, and is most effective when it is carried out at the planning stage of an exhibit or plant display. For core questions to ask when carrying out a risk assessment, see Appendix 1 (see p.33).

The three main areas to investigate are the:

- type of material being acquired
- source of material being acquired
- final destination of material.

2.2.1 Type of material being acquired

It is obvious that a large, old plant specimen has a higher risk of bringing with it pests and diseases than a small cutting or seed. The

larger the specimen the harder it is to spot low levels of pest or disease infestation and it is obviously best to aim to import the type of plant material which carries the lowest risk, whenever possible.

Table 1: Risks to the Eden Project associated with type of material being acquired

Type of plant material	Risk
Certified seed	Low
Non-certified seed	Medium
Wild-collected or donated seed	High
Tissue-cultured material *	Low
Dried flowers	Low
Dried artefacts	Low/medium
Reproductive material or storage organs	Medium/high
Plants	High
Large specimen plants	Very high

**Tissue-cultured material is considered a low risk at the Eden Project, but it does have the potential to carry viruses.*

Often, there isn't time to grow a plant for display from seed, so plants have to be imported.

2.2.2 Source of material being acquired

In certain countries around the world, notifiable pests, such as tobacco whitefly (*Bemisia tabaci*), melon thrips (*Thrips palmi*) and other high-priority or quarantine-listed pests are well established, so it is wise to avoid importing host plants from these countries. Looking at the interceptions listings on the websites of Defra Plant Health (see p.40) and the European and Mediterranean Plant Protection Organization (EPPO) (see p.41) may reveal indications that some countries regularly export specific pests or diseases on the commodity that you are considering. This may be because of pest problems in the country, or the lack of regulations or adequate inspection before export.

It is useful to know what pests and diseases might come in with a particular host plant, so that lengths of life cycles can be calculated and the plants can be isolated for the correct amount of time.

2.2.3 Final destination of material

Obviously, if the plant material is destined for a glasshouse with permanent planting and if environmental conditions are favourable for the pest, there is a high risk that any pests on the new material may transfer to and become established on the collections. Some displays may be held in a separate non-horticultural building, because of logistics or other requirements, and therefore the risk of pests or diseases spreading to and establishing on other collections is limited. Such zoning of display material may be a way of protecting permanently planted collections. However, do not underestimate the potential vector pathway of humans (visitors and staff!) inadvertently carrying organisms from one area to another. Attention should also be paid to the disposal of material after a display and whether material is added to existing collections, or not, after display.

3 Isolation and Quarantine

3.1 Basic hygiene and best practice

Much of this section relates to standard horticultural best practice and will already be commonplace in most institutions. However, it is worth emphasising some of the principles as they can make a dramatic difference to the general health of collections and the rates of transmission of pests, diseases and viruses. These basics are sometimes the first to fall by the wayside when work demands and pressures on time increase, or when there are high turnovers of staff.

Sterilise tools, such as secateurs, pruning knives and saws, between cuts, and especially between different plants. Common methods include dipping in ethanol, sterilising with a flame, or using trade sterilants such as 'Verkon' (note: with this product, dip and then wipe the blade off promptly to prevent the metal being attacked by the chemical!).

Use clean new pots, canes, cane caps etc. for new batches of material and sterilise materials between uses. It is inadvisable to re-use wooden canes as they may be difficult to sterilise completely and can aid transmission of such pests as root mealy bug and fungal pathogens. They also act as over-wintering sites for common pests, such as red spider mite.

Be aware of humans as vectors. This applies especially to isolation areas, where it is advisable for staff to wear lab coats to prevent transfer via clothing; and to movement of staff between isolation areas and other growing or display areas.

Wash hands or wear gloves between handling new batches of material and other collections.

Be aware of disease transmission on soil particles and take measures to contain any soil and growing medium received with new batches of material. Sterilise and dispose of infested soil appropriately.

If the growing area permits, space plants adequately to ensure they are not touching.

Avoid over-watering and generating large amounts of run-off. Place plants in trays, either individually or in batches, to contain water run-off and minimise the spread of disease.

Place sticky traps among batches of new material to trap and monitor any emerging pests.

Control weeds in and around glasshouses and isolation houses, as weed species may provide alternative hosts for many pests and diseases.

3.2 Isolation and quarantine facilities

If it is not possible to install separate isolation or quarantine-standard facilities, there are several aspects to consider. Even in a small-scale operation, some precautions can be adopted (details in Ebbels 2003, see p.37).

Location: Ideally, isolation facilities should be distinctly separate and sited away from other growing areas, e.g. in a separate glasshouse or polytunnel; but, if this is not possible, a separate area within a glasshouse or even a single bench can be beneficial. Line benches with plastic sheeting, or use large plastic trays to create modular systems that reduce the spread of fungal pathogens to other batches through contaminated water.

Access: If this can be limited to a few nominated staff, so much the better. Lockable facilities are secure and prevent researchers or display staff from removing material to work with before it has been passed as clean. Take steps to minimise the risk of cross-contamination. Do not allow staff or maintenance contractors to go directly from isolation facilities into other growing areas without washing their hands, sterilising tools and changing clothing. Lab coats are recommended for use in isolation facilities. Implement a basic procedure to ensure that staff working in isolation areas move from clean, uninfected areas through to 'dirty' or infected areas, but not back again!

Ensure that lab coats are sealed and frozen or autoclaved after use in infected areas.

Structure: If you have a quarantine glasshouse, it may be possible to divide it into separate sections with different environmental regimes; or, on a smaller scale within the same growing environment, you can make use of thrip-proof net bays to provide separate compartments, or use thrip-proof net cages and boxes to isolate individual plants or batches (see p.43). Having a separate vestibule or entry section to the glasshouse, to form an airlock, is advisable, to allow changes of clothing, disinfection of footwear etc. before entering or leaving the quarantine facility.

Depending on the organism to be contained, there are different grades of vent-screen netting to prevent its escape, but even the smallest mesh will not be impervious to spores or very small pests, such as thrips. If you are working on high-risk or airborne organisms, systems involving negative or positive air pressures may be required. Brushes should be fitted to vent arms and door seals, and all gaps between panes of glass should be sealed, e.g. with silicone.

Minimise and contain water run-off. In specially designed facilities, run-off tends to be via drains to an underground tank, which will have to be periodically pumped out and the water disposed of by an authorised contractor. Before draining to a soak-away, water can also be sterilised by heat or ultraviolet treatment. Facilities may include silt traps on drainage systems to filter out solid debris, which can then be disposed of separately. Simply placing plants in trays to contain run-off can help to prevent the spread of fungi between plants or batches on the same bench.

Avoid plants being in direct contact with the ground. Solid concrete bases are desirable as they can be easily disinfected and provide a barrier to prevent nematodes or fungal pathogens entering soil or ground water. Placing individual plants or batches in trays can also prevent pathogens spreading between individual plants on solid surfaces. Benches should be easy to clean and any capillary matting used should be changed between batches of plants.

Incorporating disposal facilities into the facility also minimises the risk of spreading infected materials and allows for easier working conditions. Access to an incinerator or autoclave will usually be needed in designated quarantine facilities; but, if this is not possible, there are alternative methods (see section 3.6 on disposal methods, on p.30).

Practical organisation: Use dedicated equipment in isolation facilities and in each compartment of isolation houses, e.g. hoses, lances, dustpans, brooms, debris-collection buckets and bags, to prevent cross-contamination. Mark dedicated equipment to prevent it being removed mistakenly or ‘borrowed’ for use in other growing areas. Disposable gloves should be worn when handling materials, and gloves should be changed or hands washed before each operation on new batches of material and between compartments. Installing alcohol-gel dispensers can prove very effective.

3.3 Isolation and quarantine procedures

Nominated staff should be given clear responsibility to oversee the operation of isolation facilities and incoming materials, to provide a point of contact for other staff and to liaise with plant health professionals, such as local PHSI and diagnostic services.

Establish one single point of entry for checking, recording, and sampling incoming living material onto the site. Make sure that incoming packages specify on the outside that they contain living material, and, if possible, are addressed to the nominated staff. Depending on the number of shipments you receive annually and the number of staff available, you may want to extend this to include all material of UK origin as well as EU and third-country material. Our experience shows that, even though EU material can be freely moved in trade, it does not guarantee that it is free from non-indigenous pests and diseases. Plants from UK growers and other botanic gardens or private collections may also harbour non-indigenous as well as common pests and diseases, which are more easily treated on arrival than when the plants have been added or mixed with established collections, or entered display houses and spread an infestation over a large area or number of plants.

Record all details of received consignments – this is vital to enable material to be traced back if it is found to have pest or disease problems. Records can be used to generate reports to PHSI, or to compile end-of-year returns for holders of plant import licences.

Only open shipments of incoming living material in a closed or contained area that is suitable for applying treatments for eradication of any pests and diseases found on the material, without the danger of moving them around on site.

Whenever possible, keep new shipments or batches of material separate from each other, to reduce cross-contamination.

Material newly arrived from third countries should be inspected by your local PHSI as soon as possible after arrival, or on entry when pre-notification requirements come into effect (see p.10). Inspectors will take any samples of suspected pests or diseases and send these off for laboratory diagnosis and further recommendations. Material may be held under official notice, pending diagnosis.

Material should be held in isolation for a suitable period after arrival, to confirm that it is free from pests and diseases and to ensure that no pests or diseases have developed in transit (see Appendix 2 on quarantine periods, p.35). It is inadvisable to treat material with fungicides or pesticides routinely on arrival, as this may merely suppress pest and disease symptoms, only for them to become evident after the quarantine period.

It is recommended that actively growing, living material of non-EU origin received with a phytosanitary certificate is isolated for 3–4 months; or, for dormant storage organs or large specimen plants, 6 months, to establish that they are free from pests and diseases once they are in active growth. However, if risk assessments indicate that particular pests may be encountered on imports, the plant material should be isolated for the full life cycle of the pest. If material is imported under licence without a phytosanitary certificate, it should be held for a minimum of 12 months, i.e. one complete growing season. These periods can be extended to cover all incoming material received, if facilities allow, or to all sources considered to represent significant risks, since notifiable pests may be imported via other botanical or private collections.

Disinfect each growing space between batches of material and only use new or sterilised, clean pots, composts and horticultural sundries. Do not re-use canes. Suggested sterilants for pots include Jeyes Fluid, Jet 5 and Titan Sanitiser, and should be used in accordance with the manufacturer's instructions.

3.4 Identification of problems

Monitor new arrivals carefully and continue to monitor plants throughout the isolation period, to spot problems as soon as possible and facilitate treatment. Emerging pests and diseases on previously imported material should be reported to your local PHSI. Additional samples may then be taken by PHSI and sent for diagnosis on your behalf.

Place yellow and blue sticky traps among new batches of plants and change these regularly during the isolation period.

Accurate identification of problems is critical for successful treatment. For commonly encountered pests and diseases, good pictures can be obtained for comparison from websites of commercial biological-control companies, or by entering the name of the pest or disease and 'images' in Google or other web searches (see pp.39–43).

If you have mycology or entomology experts on site, they can be asked to provide quick diagnoses, probably at a fraction of the cost of using outside agencies.

Form links and develop good working relationships with your local PHSI and other professionals, such as diagnosticians, as they are able to provide a wealth of advice.

The Central Science Laboratory, near York (see pp.40), offers a chargeable diagnostic service and may be able to recommend treatments. In Scotland, SASA (see p.38) is able to provide advice, often in conjunction with the Natural History Museum in London.

The Centre for Applied Biosciences International (CABI) also provides a chargeable diagnostic service and you can subscribe to their online *CABI Crop Protection Compendium* (see p.39), which

provides detailed information, including distribution maps of known pests, and is a useful tool in undertaking commodity risk analyses.

Forest Research (Forestry Commission), based at the Alice Holt Research Station in Surrey and at their Northern Research Station near Edinburgh, offers chargeable diagnostic services for tree problems (see p.41).

The Gardens Advisory Service of the Royal Horticultural Society, at Wisley (see p.43) offers a diagnostic and advisory service for its members.

3.5 Treatment methods

Defra PHSI and their equivalents in Scotland and Northern Ireland are able to issue mandatory treatment and destruction orders if non-indigenous or notifiable pests or diseases are found. These orders are legally binding and must be complied with at your own institution's expense. In an outbreak situation, these costs can rapidly become quite considerable and movement prohibitions on infected materials can restrict the work of your institution. CSL (or SASA in Scotland) will provide treatment recommendations via the PHSI. It is vital to build a good working relationship with your local inspectors. This strengthens the ability to negotiate with inspectors, carry out their recommendations with the resources you have and protect the interests of the UK as a whole.

Biocontrol is not an option for dealing with non-indigenous pests and diseases. The risk is too great to take chances, and so a zero tolerance policy should be enforced.

If pests or diseases are found in quarantine or isolation houses, a sample should be taken and sealed for diagnosis and then the correct treatments or disposal methods initiated as soon as possible in conjunction with PHSI. Plants should be treated to eliminate infestations before any material is propagated from them; however, contact and other insecticides may adversely affect rooting of propagation material.

If a plant or batch is badly infested, assess whether the material is of sufficient value to merit the time, effort and expense in treating the problem; or whether the batch should be destroyed to eliminate the risk to other holdings in quarantine and to wider collections, or the environment, should an escape occur.

Systemic insecticides are preferable to contact insecticides, as the whole plant and the majority of life-cycle stages can be treated. However, few insecticides are effective against eggs.

3.6 Disposal methods

Prior to disposal, waste plant material and debris should be placed in bags and sealed before removal from the compartment of the quarantine facility, to avoid the risk of spreading infestations to wider areas.

Burning: Unless you are in a smokeless zone, this is the preferred method of disposal. Contained incinerators are preferable to open bonfires. Specialised industrial incinerators for waste disposal are generally gas fired and have to be sited and installed according to waste regulations, used in accordance with the manufacturer's instructions and regularly serviced by qualified personnel.

Autoclaving: This is often more suited to small volumes of material. Follow the manufacturer's recommendations; regular servicing is essential.

Burial: This is only suitable for a limited number of sites, which have suitable barren land to set aside for this purpose. Burial must be according to PHSI's instructions and areas must be adequately signposted and mapped and records kept. Growth of crops or collections on disposal areas is not permitted.

Authorised contractors: This can be very expensive: charges are similar to those of pesticide-disposal contractors as material may need to be processed or treated before being sent to premises that are licensed for the receipt of such material as landfill.

Packing material may be infested and should be regarded as presenting a plant health risk. All packaging materials should be disposed of appropriately, to reduce the reservoir of infection.

Newspaper and cardboard: Burning is preferable, autoclaving can be used for small quantities, or packaging can be soaked in Jeyes Fluid solution before adding to other waste.

Plastics: These can be sterilised with Jeyes Fluid, Jet 5, Titan Sanitiser or other trade sterilants at manufacturer's rates. Autoclaving may be suitable for plastics marked as microwave proof. Burning should be avoided whenever possible.

Polystyrene: Autoclaving is preferable. Burning should be avoided whenever possible.

Plant debris such as straw, moss or peat used as packaging: Burning is preferable. Small quantities can be autoclaved.

3.7 Education and staff training

Unless staff have ownership and an understanding of why plant health procedures are important, they will cut corners and can obstruct what you are trying to achieve. Management, therefore, needs to foster co-operation and understanding of the issues involved throughout the institution.

Make new staff, including students and volunteers, aware of your institution's import procedures during the induction phase. This should be followed up by encouraging staff to monitor pests and diseases daily, during watering and other core horticultural operations. More formalised weekly or monthly sessions, such as 'bug hunts' and training in biological control, can also be included in regular meetings on pest-management programmes.

Compile summaries of your institution's procedures. Include them in induction packs and send them to visiting students and researchers *before* they arrive bearing gifts of plant material. Post the summaries on your institution's internal website, for easy consultation by all staff.

Circulate and provide information such as identification posters, plant health newsletters and pest and disease alerts. If at all possible, provide good quality, colour images to aid identification. Much useful material is available on the Defra Plant Health website (see pp.40–41).

Many biological-control companies have good websites (see p.43) that not only feature their products, but also show good colour images of the target pests. Pest identification sheets can be printed off and laminated for use in glasshouses.

Ultimately, prevention is usually cheaper than cure. Good interception measures combined with effective monitoring reap significant benefits, especially for the long-term health and security of plant collections. It is always better to know and find out what pests and diseases may be present or established on site than to ignore problems and have them become more costly to deal with or eradicate in the long term.

Appendix 1

Risk Assessment Questions

1 What is the commodity?

2 Is the commodity really essential for the living collections?

3 What plant health or legal documentation is required for the commodity, if any?

Do you need to inform your local Plant Health and Seed Inspectorate?

4 Where is the commodity coming from?

If the risk is high because of the source, can the commodity be obtained from another source with a lower risk?

5 Where is the commodity planned to go in your organisation?

What is the risk level of this location?

What is the environment like in this location?

6 What is the risk level of the type of plant material being obtained?

If the risk is high because of the particular plant material being sought, can lower-risk plant material be obtained, e.g. seed, tissue culture?

7 What is the plant health status of the organisation or establishment from which the commodity is to be obtained?

Have you visited the source from which the commodity is being obtained?

What controls are in place to remove pests and diseases at this source?

What pests and diseases may occur on the commodity from this source country or establishment?

Which pests are non-indigenous or notifiable in the UK?

Are these pests and diseases relevant to the type of plant material (e.g. flower, leaf, stem) being imported?

Are these pests and diseases on the EU/EPPO quarantine lists?

Have you checked the Defra interception list to see what pests and diseases have been intercepted recently?

8 What are the hosts of these pests and diseases?

What are the life stages of these pests and diseases?

Do these pests and diseases establish easily?

Would these pests and diseases be capable of establishing in your environment or the UK?

What damage do these pests and diseases cause?

Do these pests and diseases already occur in the living collections?

Appendix 2
Quarantine Periods

The life cycles of pests include stages that are not easily observed and are sometimes difficult to target with treatments. As a consequence, pests that are present on plants may not be detected by initial inspection, and treatments before they were exported may not be 100% effective. It is for these reasons that a period in quarantine is required.

To implement an effective quarantine system, it is necessary to become familiar with the life cycles of the pests that you might encounter, particularly notifiable pests. The life cycle of a pest is dependent on the host plant and the temperature. In many cases, increasing the temperature of the quarantine and isolation area will reduce the duration of the pest life cycle. The quarantine period should be calculated as the duration of the period free from the pest. This is not simply the period from egg to adult emergence (length of life cycle), but how long a potentially fecund female could live and produce offspring.

The basic calculation for a minimum period free from a pest is:

maximum recorded developmental time
+ period of female longevity.

Most life-cycle data necessary for the determination of quarantine periods and freedom from pests are provided in scientific literature. However, for some pests, limited data are available, and it is necessary to extrapolate from the closest member of the genus or family. The Central Science Laboratory (see p.40) can provide some details of life cycles and periods free of pests required for many of the major quarantine pests (and see Table 2, p.36).

Plant material must remain in isolation for a minimum period of 3 months. Consignments of large specimen plants pose a greater risk and must remain in isolation for a minimum of 6 months. However, some pests have cryptic stages that may be hidden within plant tissues or accompanying soil for a number of years, and cannot be effectively targeted with insecticides. Examples of such pests include Florida vine weevil (*Diaprepes abbreviatus*), whose larvae burrow into soil and may remain there for 6 months to more than 1 year; and *Anaplophora* species, whose larvae bore into tree trunks and can remain there for up to 3 years. If a risk assessment reveals that there is a possibility of such pests accompanying the desired plants, it would be advisable, if possible, to source the plants from countries where the pests do not occur, or to seek alternative plant species.

Table 2: Number of days for which plants in quarantine must be observed to be free from pests

Notifiable pest	Constant temperature (°C)	Number of days free from pest
Bemisia tabaci	25	72
Thrips palmi	21	34
Liriomyza huidobrensis	25	21
Opogona sacchari	25	44

Modified from PHSI handbooks (Defra internal documents) on eradication and containment.

There are also many situations where the pest life-cycle is particularly complex, and it is necessary to monitor for more than one life stage, since in certain situations the pest may follow an alternative life cycle or symptoms may not be evident. Grape phylloxera is an example of this, where a root stage may be present but foliar symptoms are not always expressed. In many cases, it is necessary for a plant to be actively growing before certain stages of the pest can be observed; for example, phylloxera-infected roots should be monitored for crawlers, and ideally the plant should be in active growth to ensure that the foliar stage of the pest is not present. It is good practice to keep dormant plants in quarantine until they have been in active growth for some time, allowing possible cryptic pests to present themselves.

Sources of Further Information

BOOKS & JOURNALS

Alford, D V (1995) *A Color Atlas of Pests of Ornamental Trees, Shrubs & Flowers*. Timber Press.

BCPC (published annually) *The UK Pesticide Guide*. CABI Publishing, UK.

Buckzacki, S & Harris, K (2005, 3rd edition) *Pests, Diseases & Disorders of Garden Plants*. Harper Collins, UK.

Cannon, R J C; Pemberton, A W & Bartlett, P W (1999) Appropriate measures for the eradication of unlisted pests. *EPPO Bulletin*, **29,** 29–36.

Ebbels, D L (2003) *Principles of Plant Health and Quarantine*. CABI Publishing, UK.

Malais, M H & Ravensberg, W J (2003 edition) *Knowing and Recognizing. The biology of glasshouse pests and their natural enemies.* Koppert Biological Systems, Netherlands.

Strouts, R G & Winter T G (2000, 2nd edition) *Diagnosis of Ill Health in Trees*. The Stationery Office, UK.

Stüssi, S; Guyer, U & Zuber, M (1999) *Handbook for Release of Beneficial Insects in Glasshouses and Indoor Cultures.* Andermatt BIOCONTROL AG & Entocare CV, Wageningen, Netherlands.

Williams, C; Davis, K & Cheyne, P (2003) *The CBD for Botanists. An introduction to the Convention on Biological Diversity for people working with botanical collections.* Kew Publishing.

For 2006 online version, see p.39.

WEBSITES

Government departments and agencies

See also ‘Detailed plant health information’ on pp.39–42.

Central Science Laboratory (CSL)
http://www.csl.gov.uk (see also p.40)

Department for Environment, Food and Rural Affairs (Defra)
http://www.defra.gov.uk (see also pp.40–41)

Department of Agriculture and Rural Development, Northern Ireland (DARD)
http://www.dardni.gov.uk

Forestry Commission
http://www.forestry.gov.uk (see also p.41)

Pesticide Safety Directorate
http://www.pesticides.gov.uk/home.asp

Scottish Agricultural Science Agency (SASA), plant health
http://www.sasa.gov.uk/plant_health/index.cfm

Scottish Executive Environment and Rural Affairs Department (SEERAD)
http://www.scotland.gov.uk

UK CITES Management Authority
http://www.ukcites.gov.uk

International conventions

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Secretariat
http://www.cites.org

CITES register of scientific institutions
http://www.cites.org/common/reg/si/e-si-beg.shtml

European Community Trade in Wild Fauna & Flora)
http://ec.europa.eu/environment/cites/home_en.htm

UK CITES Management Authority
http://www.ukcites.gov.uk

Convention on Biological Diversity (CBD) Secretariat
http://www.biodiv.org

List of CBD National Focal Points
http://www.biodiv.org/world/map.asp

The CBD for Botanists: An introduction to the Convention on Biological Diversity for people working with botanical collections. Version 2 (C Williams, K Davis & P Cheyne, 2006)
http://www.kew.org/data/cbdbotanists.html
See p.37 for hard-copy version.

Detailed plant health information

An online guide to plant disease control (Oregon State University Extension)
http://plant-disease.ippc.orst.edu/

Association of Applied Biologists
http://www.aab.org.uk/index.htm

BCPC (formerly British Crop Protection Council)
http://www.bcpc.org

CABI Crop Protection Compendium, CAB International
http://www.cabi.org/compendia/cpc/index.htm

Crop Knowledge Master
http://www.extento.hawaii.edu/kbase/crop/crop.htm

Central Science Laboratory (CSL)
http://www.csl.gov.uk

Diagnostic products and services
http://www.csl.gov.uk/prodserv/diag/

Pocket Diagnostic
http://pdiag.csl.gov.uk/splash2.html

LIAISON (guide to pesticides)
http://liaison.csl.gov.uk

UK Plant Health Centre
http://www.phc.org.uk

Defra/CSL training course for PlantNetwork
http://www.phc.org.uk/Training/UK_Plant_Network/

Code of Practice for Suppliers of Pesticides to Agriculture, Horticulture and Forestry (Yellow Code)
http://www.pesticides.gov.uk/uploadedfiles/Web_Assets/PSD/yellow_code.pdf

Code of Practice for Using Plant Protection Products
http://www.pesticides.gov.uk/safe_use.asp?id=64

Defra Plant Health
http://www.defra.gov.uk/planth/ph.htm

Code of Practice for the Management of Agricultural and Horticultural Waste
http://www.defra.gov.uk/planth/publicat/waste/index.htm

Imports and exports
http://www.defra.gov.uk/planth/impexp.htm

Import requirements for orchids
http://www.defra.gov.uk/planth/import/orchid.htm

Information booklets
http://www.defra.gov.uk/planth/pub2.htm
Information for travellers
http://www.defra.gov.uk/planth/trav.htm

Pest and disease issues
http://www.defra.gov.uk/planth/newsitems/pestdis.htm

Pest and disease posters, information sheets and leaflets
http://www.defra.gov.uk/planth/pub1.htm

Plant Health Guide for Importers
http://www.defra.gov.uk/planth/publicat/importer/impguide.pdf

Plant Health Guide to Plant Passporting and Marketing Requirements
http://www.defra.gov.uk/planth/publicat/passport/pass.pdf
http://www.defra.gov.uk/planth/pass.htm

Plant Health and Seeds Inspectorate (PHSI)
http://www.defra.gov.uk/planth/offices.pdf

Quarantine identification cards
http://www.defra.gov.uk/planth/qic.htm

European and Mediterranean Plant Protection Organization
http://www.eppo.org

EPPO activities on plant quarantine (lists of regulated quarantine pests)
http://www.eppo.org/QUARANTINE/quarantine.htm

EPPO alert list:
http://www.eppo.org/QUARANTINE/Alert_List/alert_list.htm

Forestry Commission, pathology (links to news and diagnostics)
http://www.forestresearch.gov.uk/fr/hcou-4u4jcp

Forestry Commission, plant health
http://www.forestry.gov.uk/planthealth

Forest Research, Tree Disease Diagnostic and Advisory Service
http://www.forestresearch.gov.uk/fr/INFD-5UWEY6
Global Crop Pests – identification and information (Cornell International Institute for Food, Agriculture and Development)
http://www.nysaes.cornell.edu/ent/hortcrops/english/

Google images
http://images.google.co.uk (enter name of pest or disease)

Horticultural Code of Practice. Helping to prevent the spread of invasive non-native species
http://www.defra.gov.uk/wildlife-countryside/non-native/pdf/non-nativecop.pdf

Insects, Plant Diseases, Pesticides, and Weeds (including integrated pest management), Electronic Data Information Source, University of Florida
http://edis.ifas.ufl.edu/TOPIC_Insects,_Plant_Diseases,_Pesticides,_and_Weeds

Pests and diseases of hardwood plantations (Qld, Australia)
http://www2.dpi.qld.gov.au/hardwoodsqld/1819.html

Plant Health (England) Order 2005
http://www.opsi.gov.uk/si/si2005/20052530.htm

Plant Health (England) (Amendment) Order 2006
http://www.opsi.gov.uk/si/si2006/uksi_20062307_en.pdf

Plant Health (Forestry) Order 2005
http://www.opsi.gov.uk/si/si2005/20052517.htm

Plant Health (Scotland) Order 2005
http://www.opsi.gov.uk/legislation/scotland/ssi2005/20050613.htm

Plant Health (Wales) Order 2006
http://www.opsi.gov.uk/legislation/wales/wsi2006/20061643e.htm

Plant Viruses Online – descriptions and lists from the VIDE database (virus identification data exchange)
http://image.fs.uidaho.edu/vide/refs.htm

Royal Horticultural Society help and advice
http://www.rhs.org.uk/advice/problems_archive.asp

Systematic Botany and Mycology Laboratory (United States Department of Agriculture, Agricultural Research Service)
http://www.ars.usda.gov/main/site_main.htm?modecode=12-75-39-00

Biological control

Biological Crop Protection
http://www.biological-crop-protection.co.uk/Content/Home.asp

Dove Associates
http://www.dovebugs.co.uk/techrefinf.htm

Entocare Biological Control
http://www.entocare.nl/uk/

Fargro Biological Control
http://www.fargro.co.uk

Koppert Biological Control
http://www.koppert.com

Netting for isolation areas

Cadisch insect-proof screening
http://www.cadisch.com/textsite/insectproofscreening.htm

Capatex Agro & Technical Textiles
http://www.capatex.com/agro_web/index.htm

Johnson table breeding cages
http://www.lucina.freeserve.co.uk/table.html

Glasshouses, screening and polytunnels
http://www.phc.org.uk/documents/PN5.pdf

Abbreviations

CABI	Centre for Applied Biosciences International
CBD	*Convention on Biological Diversity*
CITES	*Convention on International Trade in Endangered Species of Wild Fauna and Flora*
COP	Conference of the Parties
CSL	Central Science Laboratory
DARD	Department of Agriculture and Rural Development, Northern Ireland
Defra	Department for Environment, Food and Rural Affairs
EC	European Community
EPPO	European and Mediterranean Plant Protection Organization
EU	European Union
HM	Her Majesty's
JNCC	Joint Nature Conservation Committee
MTA	Material Transfer Agreement
PHSI	Plant Health and Seeds Inspectorate
SASA	Scottish Agricultural Science Agency
SEERAD	Scottish Executive Environment and Rural Affairs Department