



International Plant  
Sentinel Network



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# Guide to Plant Biosecurity in Botanic Gardens and Arboreta

Preventing the introduction and spread of harmful organisms



# Contents



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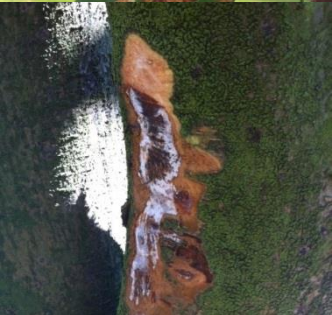
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# Relevance of Plant Biosecurity



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- Pest outbreaks have the potential to not only cause substantial damage within collections, but also spread and threaten susceptible plant species on a national level.
- Biosecurity measures are precautionary steps aimed at reducing the risk of introducing and/or spreading harmful organisms.
- This is particularly important for botanic gardens and arboreta who move plant material on a regular basis (and often between countries) and have valuable, and often rare, plant collections to protect.



# Essential Elements for Good Biosecurity

- Managers should identify staff responsible for biosecurity and ensure they have adequate support and resources
- Senior garden staff should work together to ensure that all areas of the garden are aware of and engaged with the organisation's biosecurity approach
- New material should be carefully sourced (see slide 4) and handled (slide 6)
- Gardens should have a single point of entry for all new plant material (see slide 4)
- Gardens should have quarantine areas (see slide 7) available for new plant material
- Responsible staff should make sure they are aware of any national/international regulations effecting the movement of plant material - particularly quarantine lists (see IPSN Guidance on Plant Health Governance)

# Sourcing Plant Material

Newly arrived plant material is the chief way pests and diseases are introduced into a garden. Ensuring that material is sourced carefully will help minimise the chances of introductions

## Source carefully

- Use reputable organisations and commercial companies;
  - Good history; received plant material previously with no issues
  - New companies; do some research, contact staff, visit if possible
- Ensure complete paperwork is received (e.g. Plant Passports\* in Europe or other Phytosanitary certificates)
- Where possible buy plants propagated within country
- Think carefully about the type of material and the risks it poses – **see next slide**

\*[Click here for more information on European Union legislation and Plant Passports](#)



# Mitigating Risk for Different Types of Plant Material

High Risk ↓

↑ Low Risk

<p><u>Wood, timber, bark samples</u></p> <ul style="list-style-type: none"> <li>- Can carry nematodes, insects (boring-beetles) and diseases</li> <li>- Wood with bark attached is considered particularly high risk</li> <li>- <b>Check; under international law (ISPM 15) woody packaging should be marked to show it has been treated appropriately</b></li> </ul>	<p><u>Non-certified seed</u></p> <ul style="list-style-type: none"> <li>- May carry insects externally and pathogens internally</li> <li>- <b>Inspect both seedlings and (later) young plants</b></li> <li>- <b>Source carefully</b></li> </ul>	<p><u>Dried artefacts</u></p> <ul style="list-style-type: none"> <li>- Low risk to live plants but can cause problems for herbaria, libraries and galleries</li> <li>- <b>Appropriately treat; e.g. fumigation, heat treatment or rapid freezing</b></li> </ul>	<p><u>Certified seed</u></p> <ul style="list-style-type: none"> <li>- International Seed Testing Association (ISTA) regulated</li> <li>- Unlikely to be pest free but will have very low levels of fungal and bacterial infections</li> <li>- <b>Careful planting; away from susceptible/unhealthy specimens</b></li> </ul>
<p><u>Plants</u></p> <ul style="list-style-type: none"> <li>- Pose a significant threat from any source; the wild, commercial, other organisations, in-country or further afield</li> <li>- <b>Inspect carefully on arrival</b></li> <li>- <b>Quarantine for at least 6 weeks</b></li> </ul>	<p><u>Soil and growing media</u></p> <ul style="list-style-type: none"> <li>- Carry nematodes, flatworms, insects and microorganisms such as fungi bacteria</li> <li>- <b>Quarantine with any associated plant material for at least 6 weeks</b></li> </ul>	<p><u>Tissue cultures</u></p> <ul style="list-style-type: none"> <li>- Usually considered low risk, but depends on source</li> <li>- May carry latent infections and viruses which are very hard to detect</li> <li>- <b>Source carefully</b></li> </ul>	<p><u>Dried flowers</u></p> <ul style="list-style-type: none"> <li>- Low risk to live plants but can cause problems for herbaria, libraries and galleries</li> <li>- <b>Inspect on arrival</b></li> <li>- <b>Source carefully</b></li> </ul>
<p><u>Large specimen plants</u></p> <ul style="list-style-type: none"> <li>- Harbour many pests and diseases, and are hard to inspect properly</li> <li>- Plants in leaf and with large root balls are particularly high risk</li> <li>- <b>Crucial to source carefully and know where material originated</b></li> <li>- <b>Ideally a rigorous risk assessment should be carried out)</b></li> <li>- <b>Quarantine for at least 6 weeks</b></li> </ul>	<p><u>Wild-sourced seed</u></p> <ul style="list-style-type: none"> <li>- May carry insects externally and pathogens internally</li> <li>- <b>Thoroughly inspect both seedlings and (later) young plants</b></li> <li>- <b>Where suitable, soak in a surface steriliant such as dilute hydrogen peroxide</b></li> </ul>	<p><u>Reproductive material or storage organs</u></p> <ul style="list-style-type: none"> <li>- E.g. bulbs, fruits, etc.</li> <li>- Common pathway for non-native and quarantine pests and diseases</li> <li>- <b>Thoroughly inspect on arrival</b></li> <li>- <b>Source carefully</b></li> </ul>	<p><u>Cut flowers</u></p> <ul style="list-style-type: none"> <li>- Dependent on type, source and cultural conditions e.g. tropical flowers such as <i>Phalaenopsis</i> have been found to be infested with <i>Thrips palmi</i></li> <li>- <b>Inspect on arrival</b></li> <li>- <b>Source carefully</b></li> </ul>

Type of material

- General information
- **Potential mitigation actions**

High risk (red) to Low risk (green)

# Plants on Arrival



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- Set up a single point of entry for a garden; will also assist with compliance with conventions such as CITES (Convention on International Trade in Endangered Species) and the CBD (Convention on Biological Diversity). Herbaria also benefit from using similar procedures
- Inspect all plants carefully on arrival
- Only accept delivery if happy that plants are free from unwanted organisms
- Check all necessary documentation e.g. if in Europe or sourcing European plants check plant passport number (EC Plant Passport UK/EW 12345)



More information on European Union legislation and Plant Passports:  
[http://ec.europa.eu/food/plant/plant\\_health\\_biosafety/index\\_en.htm](http://ec.europa.eu/food/plant/plant_health_biosafety/index_en.htm)



# Quarantine and Isolation Facilities



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To reduce the risk of introducing damaging organisms, new plants should be quarantined:

- All plants should be held for a minimum of 6 weeks in an isolated facility (see next slide) upon arrival
- During quarantine plants should be monitored regularly for any signs and symptoms of pest problems
- A quarantine area can range from a bench or bay in a greenhouse to an enclosed area of purpose-built facility
- No matter what size, a quarantine area should meet the requirements in the next slide





# Quarantine Area Recommended Essentials

1. Geographical isolation; separate from the rest of the garden
2. Secure area; reduced access for visitors and (ideally) staff with locked doors, barriers and appropriate signs
3. Controlled drainage; separate from the rest of the garden
4. Separate dedicated tools and equipment – regularly disinfected
5. Facilities for cleaning and disinfection (see next slide)
6. Adequate growing conditions for plants; to allow plants to continue to be cared for
7. Facilities for pesticide application
8. Facilities for incineration and disposal of infected material
9. Plant inspection and regular monitoring for pests and diseases; diagnostic skills, equipment and use of traps such as sticky traps, pheromone traps, light traps, etc.

# Clean Hands, Footwear and Equipment



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Hands, footwear and equipment (all tools and machinery) should be kept especially clean when moving in and out of high risk areas (e.g. quarantine zones/ current outbreaks)



**A standard disinfectant kit should be made available**



# Standard Disinfectant Kit



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Water container  
for ease and to  
mix with  
disinfectant

Disinfectant (*ensure you check  
relevant national guidelines*)

Bucket for cleaning  
surfaces and large  
tools such as  
machinery

Container for  
disinfectant – to  
ease appliance to  
shoes, tools and  
machinery

Associated  
consumables;  
paper towels,  
gloves, safety  
glasses



Long handled brush for  
brushing off soil and debris  
from shoes/clothes

Hoof pick for cleaning  
soil and debris off shoes

Hand sanitiser



# Managing the garden to reduce risk



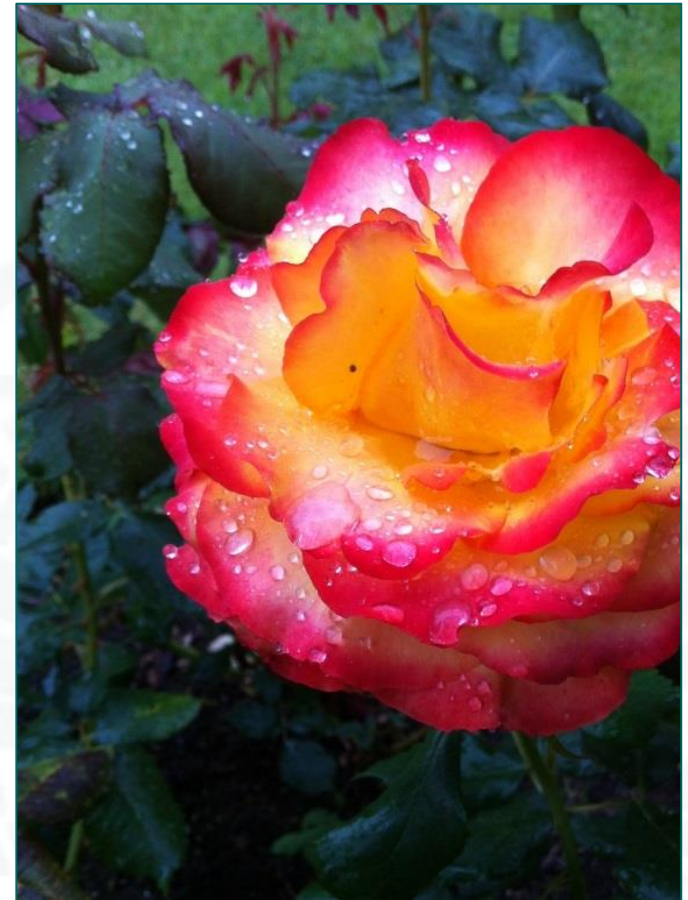
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Husbandry; a healthy plant is less likely to succumb to pests or disease

Important elements include:

- Good soil health; e.g. no compaction, watering, adequate nutrient levels
- Avoiding over-feeding; can lead to susceptible soft-growth
- Spacing; to allow air movement between plants to reduce humidity
- Careful and timely pruning; to reduce disease
- Clearing plant debris; which may harbour disease



# Managing the garden to reduce risk

## Infrastructure maintenance:

- Paths; wet and muddy areas can harbour pests disease which can then be easily spread on footwear and machinery
- Signs and fencing; restricts the access of visitors (and staff) to high risk areas reducing the movement of damaging organisms in these areas



# Managing the garden to reduce risk



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## Irrigation:

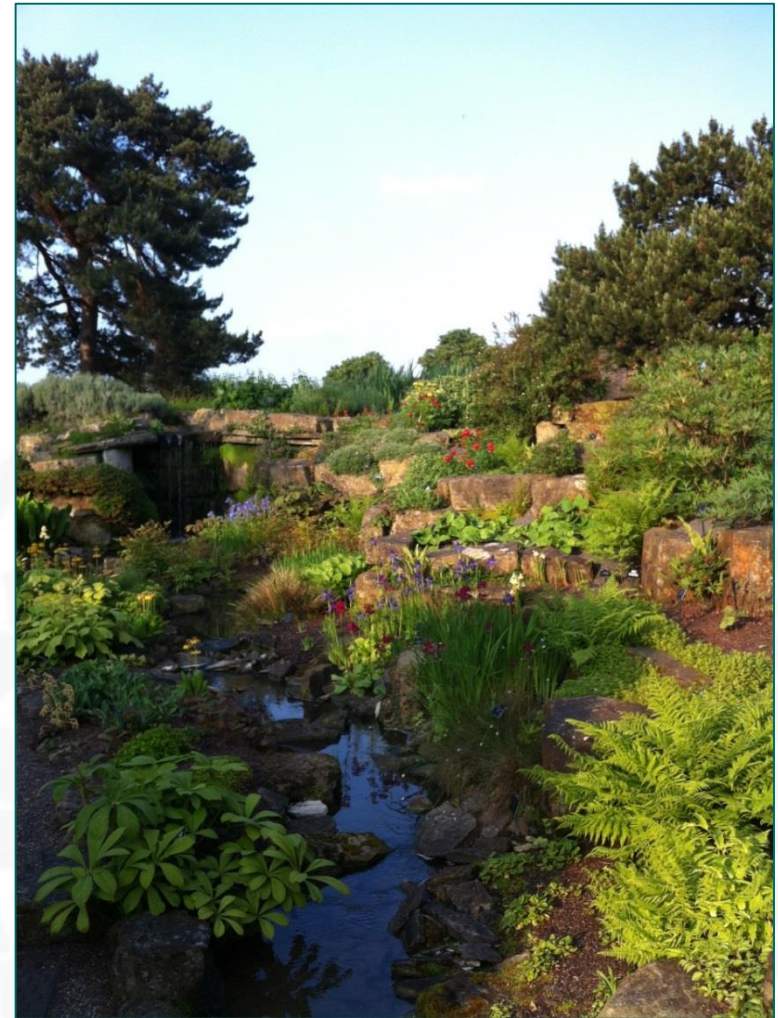
- Water sources may harbour plant pathogens
- Mains and borehole water tend to pose less risk than river/pond water
- Locally stored water (e.g. irrigation ponds/tanks) may harbour plant pathogens



# Managing the garden to reduce risk

## Drainage:

- Plant pathogens may spread in run-off from infected areas
- Check drainage and run off routes to reduce risk
- Good systems also help maintain the general health of plants (slide 11)



# Managing the garden to reduce risk

## Waste disposal

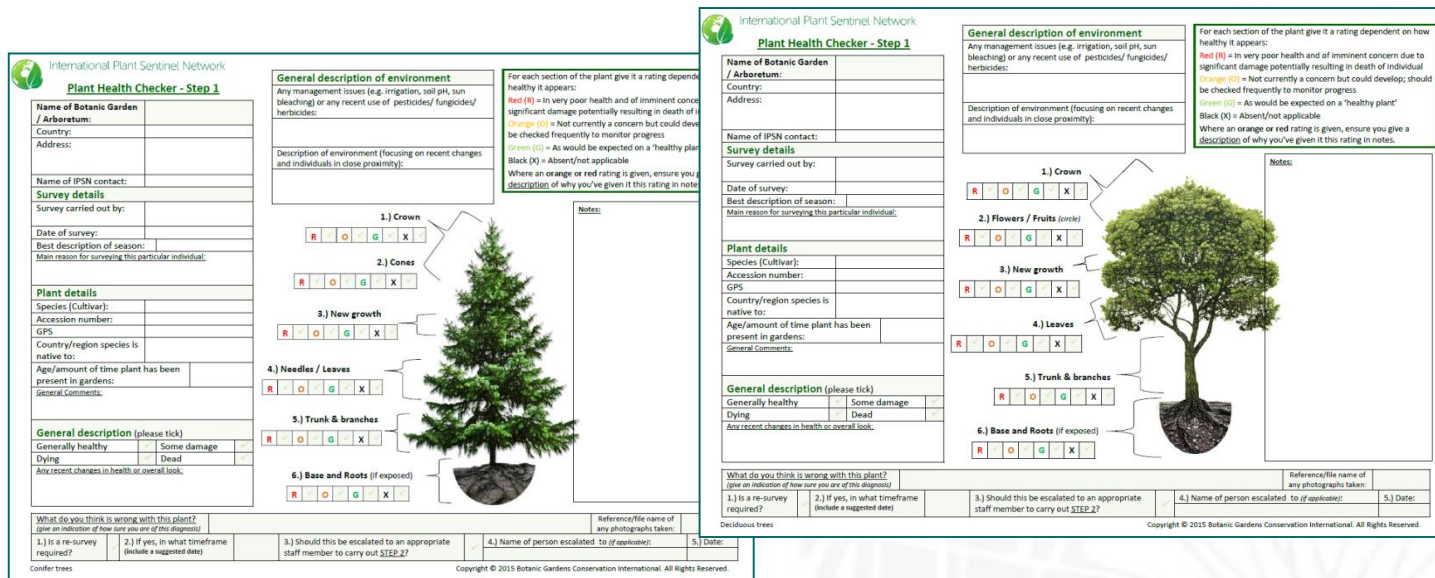
- All known infected plant material should be burnt to stop spread
- For non-infected material correct composting (e.g. 60°C for 7 days) will kill most organisms





# Managing the garden to reduce risk

Continuous monitoring will help for the quick identification and subsequent treatment of any outbreaks, which increases the success rate of any management programmes



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**Plant Health Checker - Step 1**

**General description of environment**  
Any management issues (e.g. irrigation, soil pH, sun bleaching) or any recent use of pesticides/fungicides/herbicides:  
Description of environment (focusing on recent changes and individuals in close proximity):

**For each section of the plant give it a rating depending on how healthy it appears:**  
Red (R) = In very poor health and of imminent concern significant damage potentially resulting in death of individual  
Orange (O) = Not currently a concern but could develop; should be checked frequently to monitor progress  
Green (G) = As would be expected on a 'healthy plant'  
Black (X) = Absent/not applicable  
Where an orange or red rating is given, ensure you give a description of why you've given it this rating in notes.

**Notes:**

**For each section of the plant give it a rating dependent on how healthy it appears:**  
Red (R) = In very poor health and of imminent concern due to significant damage potentially resulting in death of individual  
Orange (O) = Not currently a concern but could develop; should be checked frequently to monitor progress  
Green (G) = As would be expected on a 'healthy plant'  
Black (X) = Absent/not applicable  
Where an orange or red rating is given, ensure you give a description of why you've given it this rating in notes.

**1.) Crown**  
R O G X

**2.) Cones**  
R O G X

**3.) New growth**  
R O G X

**4.) Needles / Leaves**  
R O G X

**5.) Trunk & branches**  
R O G X

**6.) Base and Roots (if exposed)**  
R O G X

**1.) Crown**  
R O G X

**2.) Flowers / Fruits (circle)**  
R O G X

**3.) New growth**  
R O G X

**4.) Leaves**  
R O G X

**5.) Trunk & branches**  
R O G X

**6.) Base and Roots (if exposed)**  
R O G X

**General description (please tick)**  
Generally healthy  Some damage   
Dying  Dead   
Any recent changes in health or overall look:

**What do you think is wrong with this plant?**  
(give an indication of how sure you are of this diagnosis)

1.) Is a re-survey required? 2.) If yes, in what timeframe (include a suggested date) 3.) Should this be escalated to an appropriate staff member to carry out STEP 2? 4.) Name of person escalated to (if applicable): 5.) Date:

Deciduous trees

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Any unknown (or known) problems can be recorded and monitored using the [IPSN Plant Health Checker](#)

# Acknowledgements

## For information included, thanks to:

Sara Redstone – Plant Health and Quarantine Officer at Royal Botanic Gardens, Kew

## This guide was created in collaboration with:

BGCI's Manual on Planning, Developing and Managing Botanic Gardens

## For more information:

<http://plantnetwork.org/links/plant-health-links/national-trust-plant-quarantine-biosecurity-guidance-notes/>

[http://www.forestry.gov.uk/pdf/FC\\_Biosecurity\\_Guidance.pdf/\\$FILE/FC\\_Biosecurity\\_Guidance.pdf](http://www.forestry.gov.uk/pdf/FC_Biosecurity_Guidance.pdf/$FILE/FC_Biosecurity_Guidance.pdf)



# International Plant Sentinel Network

*An early-warning system for new and emerging plant pests and diseases*

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This resource was developed as part of the IPSN. Membership to the IPSN is free and provides access to a host of other resources for the management and identification of plant pests and diseases

*Find out more at:*

[www.plantsentinel.org](http://www.plantsentinel.org)

 [@IPSN\\_BGCI](https://twitter.com/IPSN_BGCI)



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*Connecting People • Sharing Knowledge • Saving Plants*

Our Mission is to mobilise botanic gardens and engage partners in securing plant diversity for the well-being of people and the planet

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