



International Plant Sentinel Network

A reference guide to accompany the deciduous
and conifer

IPSN Plant Health Checker



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The Plant Health Checker

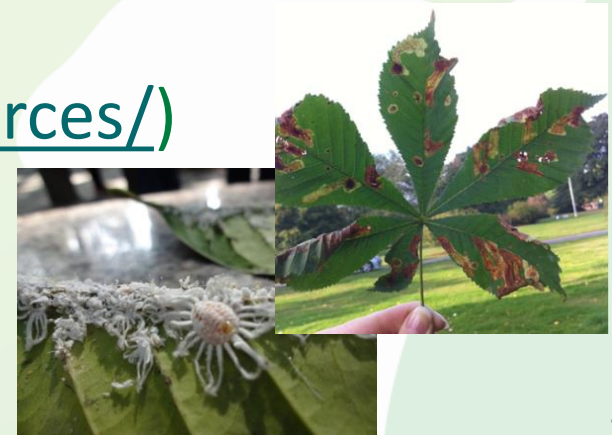
The Plant Health Checker aims to:

- Recognise and record change in plant health
- Provide a standard format to record symptoms so that damage can be tracked and monitored
- Provide a structured way to record change so, if needs be, this information can be used by plant health scientists to help diagnose a problem
- Provoke thought as to the cause of any damage;
- Identify when a problem needs to be escalated to more experienced staff and/or the National Plant Protection Organisation (NPPO)

This survey is designed for use by botanic garden and arboreta staff.

Photographs

- Pictures are useful aids to accompany the form (for both colleagues and diagnosticians)
- Photographs are a great way to record signs and symptoms
- Ensure you include a reference and/or file name for any pictures taken so that these can be tracked and used alongside the form
- For more information on taking pictures for diagnostic purposes the IPSN has a guide (<http://www.plantsentinel.org/resources/>)



Use of Data

Data provided using the Plant Health Checker will be used to identify and increase understanding of risks to plant health by helping to;

- Identify potentially damaging but currently unknown risks that need further investigation
- Increase knowledge and understanding of known risks
 - Improve pest and pathogen host lists
 - Detect geographical movement through a region/country
 - Suggest dispersal mechanisms
 - Suggest potentially tolerant host species/individuals
 - Suggest potential biocontrol agents

Step 1

The first page of the plant health checker can be completed by anyone of any level of experience.

- It aims to provide an initial assessment of a plant's health to determine if it needs further attention/continued surveillance
- It also aims to make surveyors think about other causes of damage other than pests and pathogens:
 - Environmental (such as damage caused by weather, temperature, pH of soil, drought... etc.)
 - Management (such as damage caused by use of pesticides, herbicides, drainage issues... etc.)

Step 1

- The Plant Health Checker will rate the 'health' of parts of the plant using the red, orange, green system as below:

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 to include a description why this rating was given in the accompanying notes.

Step 1: What to survey...



Step 1: Final Assessment

What do you think is wrong with this plant? <i>(give an indication of how sure you are of this diagnosis)</i>		Reference/file name of any photographs taken:	
1.) Is a re-survey required?	2.) If yes, in what timeframe <i>(include a suggested date)</i>	3.) Should this be escalated to an appropriate staff member to carry out <u>STEP 2</u> ?	4.) Name of person escalated to <i>(if applicable)</i> :
			5.) Date:

The last part of the form is for a final round up of results. It importantly allows space to note:

- A potential diagnosis (whether that be a pest/disease, or an environmental/management issue)
- File names for any accompanying photographs
- Proposed next steps
- A decision on whether step 2 is required, and who the form has been passed on to (if required) for tracking progress

Step 2

- This section should be completed if escalation is specified by STEP 1
- It should be carried out by an appropriately trained staff member, preferably someone:
 - With a good working knowledge of individual plants within the garden; history, health
and/or
 - With reasonably good knowledge regarding plant pests and pathogens

Step 2 – What to look for

- Tick all signs/symptoms that are at abnormal levels or are unexpected for the individual plant; e.g. are out of the ordinary/new to the plant and/or causing notable damage that could effect the overall health of the plant and potentially lead to its death.
- Give a description and an indication of severity/abundance in the notes, plus note anything else of importance or interest
- Include pictures of notable problems



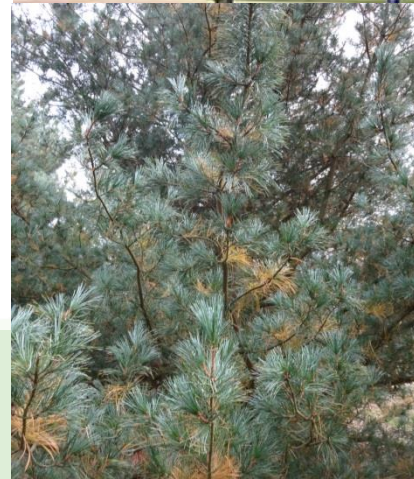
1. Crown

Start by assessing the general health of the crown; the main body of the tree. Crown health can give vital clues about the plant's health in general. Check for:

- Thin/sparse leaves and/or branches
- Yellow leaves/needles
- Large sections of dead wood
- *Conifer only* – brown patches; with an indication of size and number

All the above may be a sign of damage by a pest or a pathogen, or root problems (such as root rot, water logging, drought)

You may want to note in the comments whether there has been any dramatic changes in the overall shape of the crown



2. Blossoms/Flowers or Cones/Fruit

Generally check for anything out of the ordinary, particularly looking for significantly high levels of flowers, blossoms, cones or fruits that are:

- Dead
- Malformed (differs from expected)
- Swollen (expanded, larger than expected)



3. New Growth

Recent plant growth (leaves, shoots, etc.) can be indicative of new plant pest or pathogen problems. Similarly a lack of them can also reveal much about the cause of a problem.



Wilting – a loss of rigidity, often caused by a lack of access to water



Dieback – when a tree or shrub begins to die from the tip of its leaves or roots

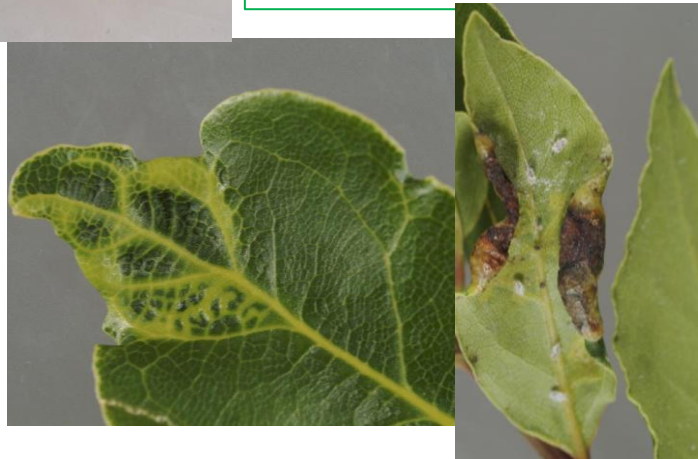
4. Leaves

Survey a variety of leaves around the tree, including old and new growth

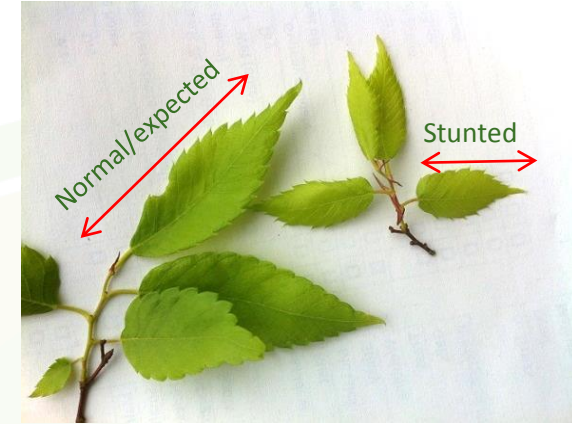
Report high / significant levels of damage and deformity only



Malformed – leaves (or needles) that differ in shape from expected



Smaller/stunted



Leaf galls - Swelling, bump or growth in leaf with a range of causes including viruses, fungi, bacteria, insects and mites

4. Leaves - discolouration



Mosaics/
mottled -
Yellowing
of the
leaves in
patterns
and spots

Rust - small pustules
(lumps) on leaves
(or needles), vary in
colour but usually
orange, yellow or
brown caused by
fungi



Mildew - Thin layer
of usually whitish
growth which is
woolly, downy or
furry in texture
(mouldy)

4. Leaf spots

Note details of any leaf spots, tick all that are relevant and use the traffic light system to give some idea of the extent



Chlorotic - yellowing of leaves in the areas between veins, resulting from a lack of chlorophyll



Necrotic - Browning and dieback of leaf edges and tips which is often (but not always) caused by drought

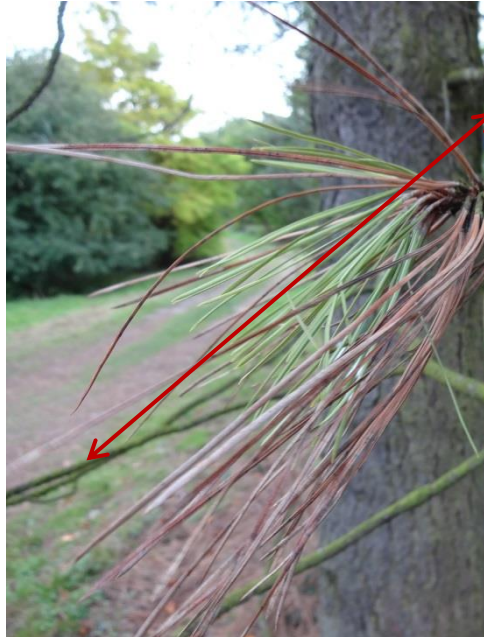


4. Needles

Dieback – is when a tree or shrub begins to die from the tip of its leaves or roots. For conifers it is important to note at what age needles this is happening at:



Death of new growth



Death of second year growth



Death of third (and second) year growth etc.

Give a rough estimate of what percentage of the tree shows this kind of damage and in the notes comment on what part of the tree is most effected (top, middle, bottom)

4. Needles - bands

This may not be obvious at first, but looking closely at discoloured needles may reveal banding (as opposite)



Light green / yellow banding

Single bands



Multiple bands



Brown / red bands

All banding included on this page are examples of Dothistroma needle blight damage

5. Trunk & branches - Cankers

Cankers are small patches of dying or dead tissue which often appear as cracks – these can be caused by a wide range of organisms; fungi, bacteria, mycoplasmas and viruses but can also be caused by extreme weather.

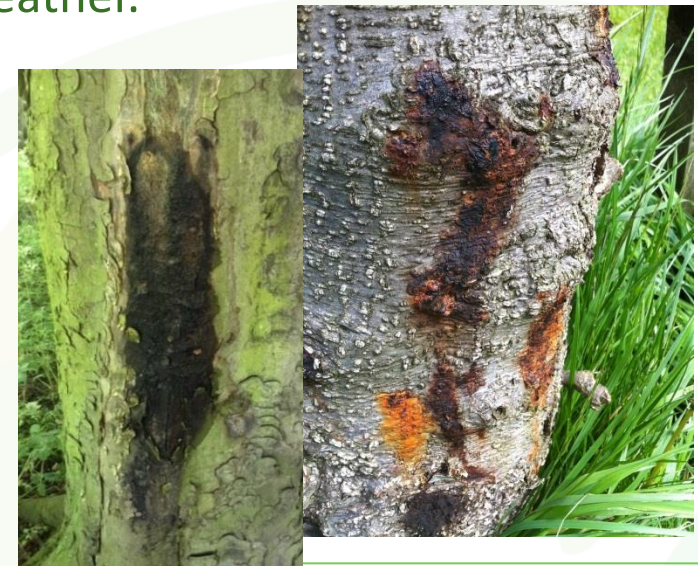


Dry/Gummy
– check for presence of liquid, sticky /gummy texture



Approx. size (m)

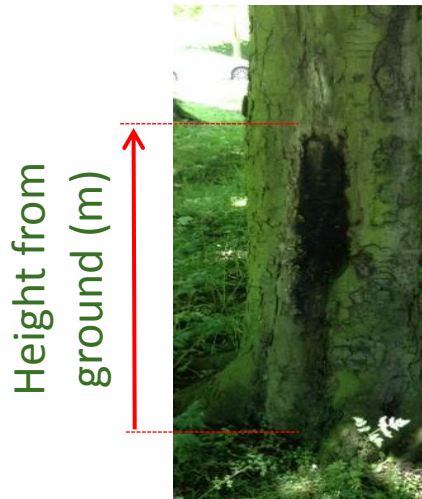
Galls - Swelling, bumps or growths



Wet (ooze) or bleeding (Resinosis) canker – can be an indication of *Phytophthora* damage
(continued next slide)

5. Trunk & branches (Continued)

For bleeding cankers - note:



Flaking bark

Pull (very gently) at any loose-looking bark to reveal if there is any flaking, it will also let you look for the presence of insect galleries (as detailed in section 7)



Vertical bleeds

Horizontal bleeds

6. Base, Roots & Groundcover



Mushrooms or toadstools - found on plant

Fungal mycelium – paper thin strands, often appearing like branches or roots (vegetative part of a fungus)



Bootlaces/black strands - black or brown root-like cords, these are rhizomorphs, part of a fungus with a similar function to roots

Decay/Rot – brown or black inside the root (when cut or damaged), roots softer than expected and easily broken



Look out for signs of mammalian damage

7. General Pest Observations



Insect galleries - tunnels forming patterns found under loose bark made by wood boring insects

Insect eggs - can range in shape, colour, size and numbers, but usually identifiable and found in clumps in non-exposed areas (on or under leaves, bark or branches)



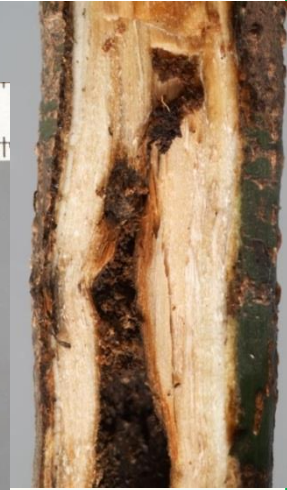
Insect webbing - Webbing (not caused by spiders), often in only very small patches



Chewing damage - seen in significantly high levels



7. General Pest Observations



Frass - fine powdery material or perforated wood found in clump, often produced by wood boring insects or the excrement of insect larvae

Bore holes - small holes found on the trunk and branches, which are the exit holes of wood boring insects



Insect mines - tunnels forming patterns made by leaf mining insects



8. Pest Sightings

- If any pests are actually observed these should be recorded and pictured (if possible)
- If pest is known write the name, if not give best description/photo
- If possible, and the insect has caused large amounts of damage, get a specimen and store in a container (in 70% isopropyl (rubbing) or ethyl alcohol if possible) and send to a diagnostic laboratory



Citrus longhorn beetle



Emerald ash borer



Oak processionary moth

General Observations & Additional Notes

This is your chance to note down any other comments or observations that you do not feel has been captured by the rest of the form

If you suspect that the damage is caused by a certain pest or pathogen please feel free to note this in this part, including why you think this (e.g. previous outbreaks in close proximity, familiarity with the problem etc.)

Include a reference or file name for any corresponding photographs taken

Step 2: Final Assessment

What do you think is wrong with this plant? <i>(give an indication of how sure you are of this diagnosis)</i>		1.) Is a re-survey required?	2.) If yes, in what timeframe <i>(include a suggested date)</i>	
3.) Should this be reported to the local diagnostic laboratory - a physical sample may be required <i>(this is only if symptoms are severe or if a pest of concern)</i>	✓	3.) Date reported:	4.) Should this be escalated to local <u>National Plant Protection Organisation (NPPO)</u> ? <i>(as advised by local diagnostic laboratory)</i>	5.) Date reported:

The last part of the form is for a final round up of results. It importantly allows space to note:

- A potential diagnosis (whether that be a pest/disease, or an environmental/management issue)
- Proposed next steps:
- A diagnostic laboratory should be contacted if the problem is severe and causing the death of the plant, or if the organism is potentially a pest of concern (each country will have a list of 'most unwanted' pests and diseases which if found should be reported immediately)
- Diagnostic institutes will help inform whether it is necessary to contact your local National Plant Protection Organisation

Recording & Reporting

Information escalated to diagnostic laboratories and/or NPPOs will be used accordingly to manage outbreaks or inform plant health. However, all the information gathered could be useful and is important to report:

- This information will eventually go into an online database that can be accessed by IPSN member gardens and associated institutes who can use it to spot similar problems/trends
- Data will be explored and extrapolated for use by plant health scientists to inform National Plant Protection Organisations
- Each botanic garden can use forms to monitor specimens in their collection they are concerned about

For now the data is being collected and stored by the IPSN Coordinator Ellie Barham – please send scanned copies to ellie.barham@bgci.org

Images courtesy of:

- Bugwood, U.S. - <http://www.bugwood.org/ImageArchives.html>
- Food and Environmental Research Agency (Fera), UK - <http://www.fera.defra.gov.uk/>
- ObservaTree, UK - <http://www.observatree.org.uk/>
- OPAL, UK - <http://www.opalexplorenature.org/treesurvey>

More Information & Helpful Links:

- CABI Plantwise Knowledge bank - <http://www.plantwise.org/KnowledgeBank/home.aspx>
- European and Mediterranean Plant Protection Organization (EPPO) - <http://www.eppo.int/>
- Sentinel Plant Network, U.S. - <http://www.sentinelplantnetwork.org/>



International Plant Sentinel Network

An early-warning system for future pest threats

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