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Tools and methods for detecting invasive pathogens

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Based on:

Field Guide for the Identification of Damage on Woody Sentinel Plants

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1. Whole plant observation

- Diseased tree experiences deviations from its normal functioning (*There is something wrong...*)
- Great variety of symptoms

1. Whole plant observation

- Symptoms
 - chlorosis/necrosis
 - yellowing (leaves)
 - wilting (leaves and shoots)
 - cankers on branch and stem
 - root decay
 - (tree mortality)

1. Whole plant observation

- Symptoms can be caused by
 - invasive pathogens (NOT ONLY!)
 - drought
 - flooding
 - wind
 - extreme temperatures
 - management practices
 - ...

1. Whole plant observation

- Symptoms are caused by
 - **invasive pathogens** (NOT ONLY!)
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1. Whole plant observation

- Tree damage **process**...
 - Stress (drought, heat, ...)
 - Dieback
 - Decline
 - Mortality
 - ...
 - mixture of abiotic and biotic factors

2. Parts of the tree affected...

- Foliage
- Flowers
- Fruits & seeds
- Twigs, branches & stem
- Buds & shoots
- Roots and collar

3. Sampling of pathogens

- General recommendations I.
 - Diseased plant may be affected by more than one pathogen and display various symptoms
 - Check the whole plant and do not consider only a specific organ
 - If a plant shows a general crown decline without specific above-ground symptoms, check the roots
 - Take samples from all symptomatic organs
 - The collected samples should represent all the symptoms observed

3. Sampling of pathogens

- General recommendations II.
 - Do not collect dead plants or plant organs
 - Do not collect samples in rainy weather
 - Collect the whole plant whenever possible
 - Place the samples in paper or plastic bags of appropriate size
 - Label the samples properly
 - Send the samples immediately after collection to the diagnostic laboratory
 - Clean and disinfect your tools
 - Take pictures



3. Sampling of pathogens

- a) Bark
- b) Wood
- c) Shoots
- d) Leaves/needles
- e) Roots

3.a Bark

Symptoms visible on the bark include outer depression, discoloration, and cracks

- Identify the margins of the lesion
- Carefully remove the outer bark to definitively reveal the front of the lesion in the inner bark (use knife or chisel)
- Cut and remove a piece of bark of a few cm² including both healthy and symptomatic tissue
- Label, pack and send the sample

3.b Wood

- Choose a declining branch not yet completely wilted
 - Entire branch, if small
 - Cubic sample including relevant part of the wood, if large
- In case no discoloration is evident in the wood, proceed as for sampling of roots
- Label and pack the sample, and send it to the diagnostic laboratory.

3.c Shoots

- Samples may include wilted or necrotic shoots, flagging & discoloration
- Collect the whole shoot by cutting through the healthy tissue about 3 to 5 cm below the symptomatic part
- As shoots are fragile, it is imperative to collect them dry and send them as fast as possible to the diagnostic laboratory

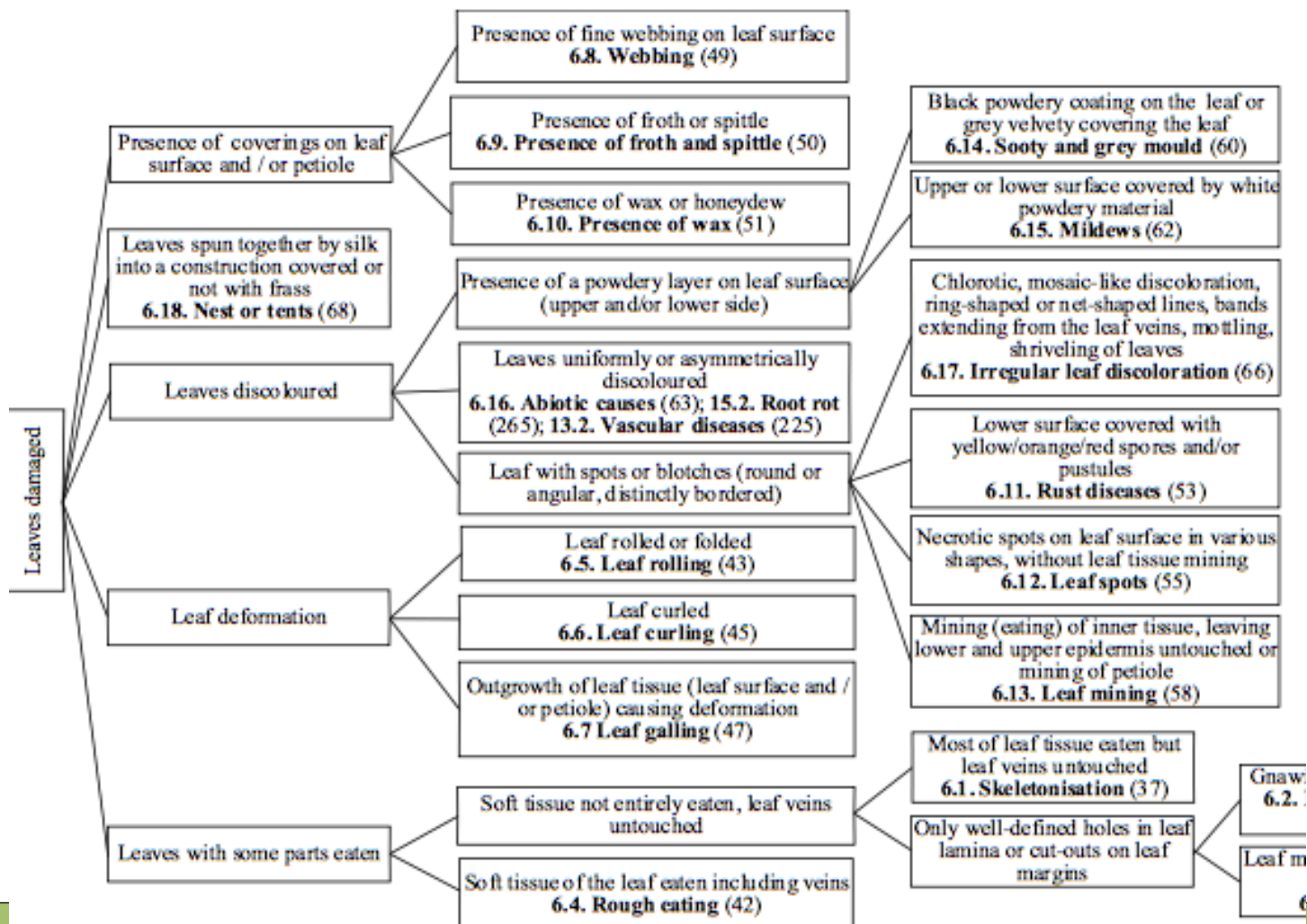
3.d Leaves/needles

- Collect the whole leaf and not only parts of it:
 - with all symptom types
 - with all leave stages
 - with stomata & fruiting bodies if available
- If all leaves on a small branch or twig are wilting, include a piece of the adjacent branch/twig in the sample
- As leaves are fragile, it is imperative (more so than for bark samples) to collect them dry

3.e Roots

- Root sampling can be labor intensive
- Select four points at a distance of 50-100 cm from the tree
- At each point remove the litter from the soil surface and collect soil until a depth of 20-25 cm (total of 200-300 g of soil for each tree)
- If no roots are visible, remove the soil to expose at least the main superficial or shallow roots.
- Remove the soil from the root surface using a brush
- If something is visible, proceed as for bark sampling

Diagnostic key



Thank you for your attention!

