Observatree
monitoring tree health

Field Identification Guide

Beech leaf disease

Photograph courtesy of David Burke, Science and Conservation, Holden Forests and Gardens, Kirtland, Ohio, USA.

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Beech leaf disease

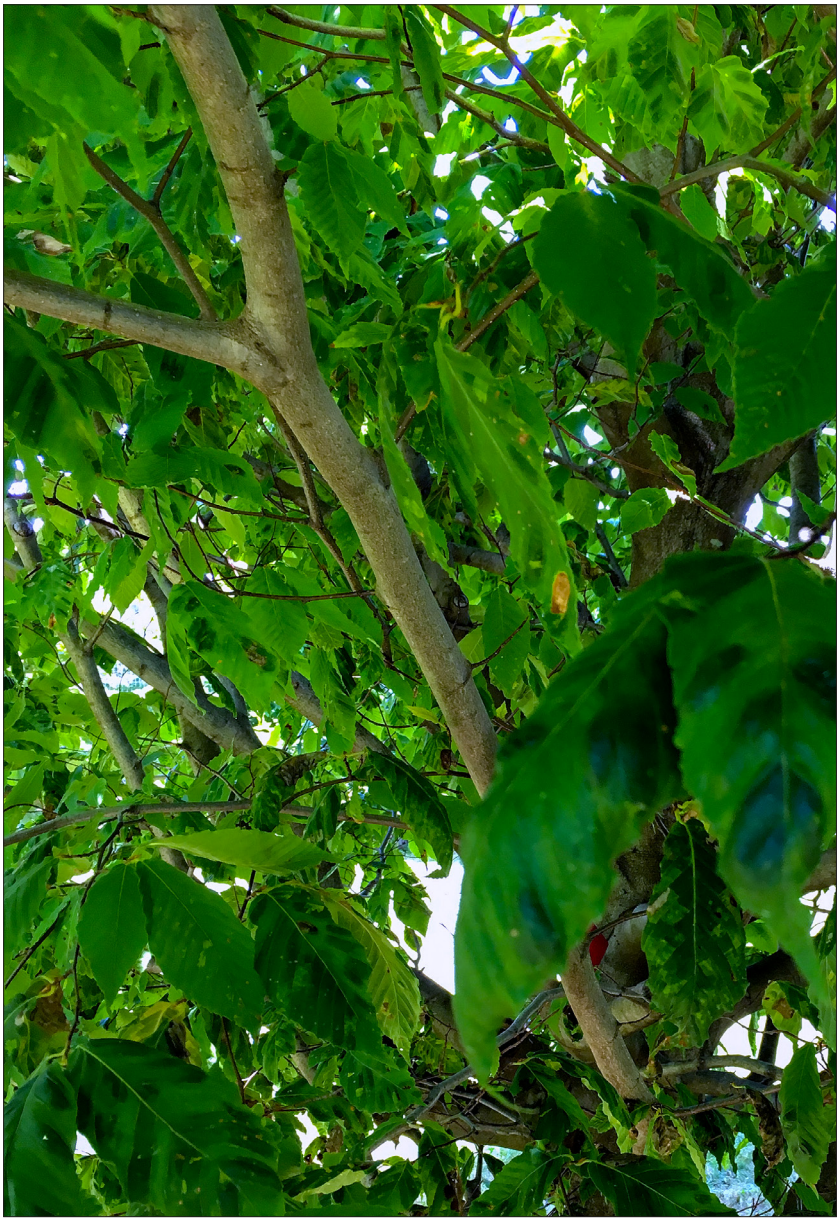
A new disease of beech trees (*Fagus* spp.) named 'Beech leaf disease' (BLD) is spreading through forest areas in eastern USA and Canada. The disease was first reported on American beech in Ohio and rapidly spread to forest and landscaped areas in neighbouring regions. A nematode (*Litylenchus crenatae mccannii*) has been isolated from the symptomatic leaves and buds. As BLD is a recently described syndrome, the biology and distribution need further study to assess the potential risk of this nematode, and to evaluate whether the disease is also associated with a complex of pathogens.

Species affected	BLD is mainly known to affect American beech (*Fagus grandifolia*). However, symptoms have been observed on European beech (*F. sylvatica*) and oriental beech (*F. orientalis*). Chinese beech (*F. engleriana*) is also considered to be a potential host. As a recently described syndrome, the risk to other *Fagus* species is yet to be determined.
Signs and symptoms	The pathogenic nematode associated with BLD symptoms may be present in leaves, buds and leaf-litter, although the presence of these nematodes in asymptomatic material is not unusual. However, recent studies indicate that nematode dormancy and optimal conditions may be required for successful infection and subsequent symptom development. Symptoms of beech leaf disease include: dark bands forming between the veins of leaves; leaves becoming curled, deformed and shrivelled; premature leaf drop; aborted buds; and thinning canopy. Early symptoms include dark-green striped bands between lateral leaf veins and reduced leaf size. Banded areas usually become 'leathery' and leaf curling may be observed. It can be quite helpful to stand underneath the canopy and look upwards as this may help you see the dark bands between the veins of the leaves. As symptoms progress, buds fail to develop, leaf production is reduced and premature leaf drop lead to an overall reduction in canopy cover, ultimately resulting in death of sapling-sized trees within five years and mature trees within 10 years. In areas where the disease has established, the proportion of symptomatic trees can reach more than 90%. However, some variability in susceptibility and symptom development has been reported. The numbers of nematodes present in symptomatic foliage will fluctuate throughout the year and they can overwinter in buds and fallen leaves.

	Similar symptoms may be caused by other native pests and pathogens (such as leaf miners and mites) which are illustrated in this identification guide. It also includes the fungal pathogen *Petrakia liobae,* another non-native organism. Infected trees develop brown, irregular leaf spots with sharp, dark borders. These necrotic spots are around 1–50 mm in diameter and may merge in cases of heavy infection. Look for symptoms in the lower canopy as *P. liobae* overwinters in leaf-litter and reinfects beech trees in the spring. A key diagnostic feature for BLD is that leaf spots do not cross the leaf veins.
Timing	Symptoms are visible on green foliage during the growing season. Aborted buds may be seen from late spring, but this could be caused by other factors. The key diagnostic feature of bands between veins of leaves will not be seen until early summer and then into early autumn. Symptoms become harder to distinguish during autumn due to natural senescence.
Biosecurity	The disease is spread both long distances and locally by infested plants, windborne infested plant material (leaves/shoots) and leaf-litter/soil infested with nematodes. It is extremely important that no plant material or soil from infected trees are removed from a site as they may harbour nematodes. All clothing, including the inside of boots, hoods and outer pockets, should be brushed down and checked for tree-derived material. Boots should be cleaned and disinfected before and after every site visit. Keep vehicles on hard tracks and ensure that they are kept clean so that they are easier to disinfect when necessary.
Reporting requirements	This is a notifiable pest so if you find it you must report it. Please report through TreeAlert (https://treealert.forestresearch.gov.uk). In Northern Ireland, please report via the TreeCheck website (www.treecheck.net) or phone app, or by emailing planthealth@daera-ni.gov.uk

Based on information available in January 2022.

Signs and symptoms



Photograph courtesy of David Burke, Science and Conservation, Holden Forests and Gardens, Kirtland, Ohio, USA.

Fagus grandifolia (American beech) showing early beech leaf disease symptoms: dark-green striped bands between lateral veins of leaves.

Photograph courtesy of David Burke, Science and Conservation, Holden Forests and Gardens, Kirtland, Ohio, USA.

Fagus grandifolia (American beech) showing beech leaf disease symptoms of dark-green striped bands and chlorosis (yellowing) between lateral veins of leaves.

Signs and symptoms

Photograph courtesy of David Burke, Science and Conservation, Holden Forests and Gardens, Kirtland, Ohio, USA.

Fagus grandifolia (American beech) showing beech leaf disease symptoms of dark-green striped bands and distortion between lateral veins of leaves.

Photograph courtesy of Colette Gabriel and David McCann, Ohio Department of Agriculture, Reynoldsburg, Ohio (OH), USA.

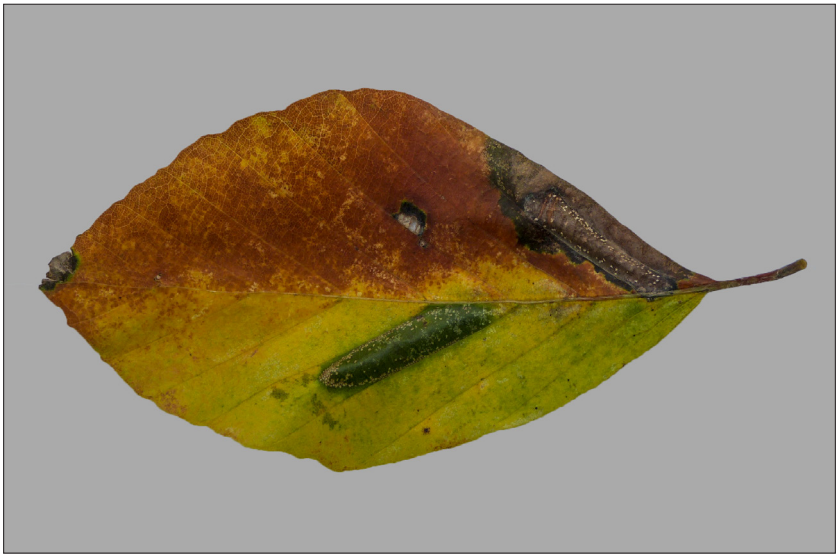
Fagus sylvatica (European beech) beech leaf disease symptoms including: darkened green bands, chlorosis and necrosis, leathery appearance and a reduction in leaf size.

Photograph courtesy of Colette Gabriel and David McCann, Ohio Department of Agriculture, Reynoldsburg, Ohio (OH), USA.

Fagus grandifolia (American beech) beech leaf disease symptoms including: darkened green bands, chlorosis, and necrosis, and a reduction in leaf size.

Photograph courtesy of Richard Churchman.

Blotch-mines on beech leaves, likely caused by leaf miners (belonging to the family Gracillariidae) that will develop into moths in the genus *Phyllonorycter*.



Photograph courtesy of Richard Churchman.

Fallen and degraded beech leaf displaying natural senescence in early autumn, with possible older vacated mines caused by an unknown leaf miner.

Look-alike signs and symptoms

Photograph: Ana Pérez-Sierra, Forest Research.

Anthracnose caused by *Apiognomonia errabunda* on *Fagus sylvatica*.

Photograph courtesy of Richard Churchman.

Symptoms on beech leaves likely caused by the mite *Aceria nervisequa*.

Look-alike signs and symptoms

Photograph: Courtesy of Richard Churchman.

Possible insect blotch-mine on beech leaves.

Photograph: © Ludwig Beenken, Swiss Federal Research Institute WSL.

Beech leaf with necrotic spots, blotches and white fluffy propagules of *Petrakia liobae*.

Photograph: © Ludwig Beenken, Swiss Federal Research Institute WSL.

Beech leaf with necrotic spots caused by *Petrakia liobae*.

Photograph courtesy of Thomas Prior, Fera Science Ltd.

Fagus sylvatica (European beech) leaves displaying natural senescence in early autumn.

Published by Forest Research as part of the Observatree project.

Observatree aims to create a tree-health early-warning system using citizen science.

Observatree is a partnership project led by Forest Research, the research agency of the Forestry Commission. Project partners are the Animal & Plant Health Agency (APHA), Department for Environment, Food & Rural Affairs (Defra), Fera Science Ltd, the Forestry Commission, the National Trust, Scottish Forestry, the Welsh Government and the Woodland Trust. Supporting the project is Natural Resources Wales. The first four years of this project was 50% funded by the EU's LIFE programme.

Acknowledgements:

Tom Prior, Rebecca Lawson and Charles Lane, Fera Science Ltd, for compiling this guide based on a review of current literature and with technical contributions from experts across the Observatree partnership.

All those who have given permission for images to be used within the guide.

The Communications Team, Forest Research, for the original design and creation of the guide.

This booklet forms part of a set that supports Observatree volunteers when out looking for priority pests and diseases. It supplements face-to-face training and is not intended as a full or detailed description. It will also be useful for others who have some knowledge of the particular pest or disease and understand how to look for these. Further information is available online from the websites listed below:

www.observatree.org.uk

www.forestresearch.gov.uk/tools_and_resources/fthr/pest-and-disease-resources/

www.gov.uk/guidance/prevent-the-introduction-and-spread-of-tree-pests-and-diseases

https://planthealthportal.defra.gov.uk

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