



THE HEATHER TRUST

Promoting Integrated Moorland Management



Phytophthora

Phytophthora (pronounced fy-TOFF-thora) is a highly infectious genus of pathogenic organisms which causes a dramatic and destructive impact on plants. Phytophthora takes its name from the Greek words meaning “plant destroyer”, and there more than one hundred different species known to science and quite possibly several hundred more yet to be identified. Perhaps the most famous of these is *P. infestans*, the pathogen responsible for potato blight.

In recent years, human activity has spread Phytophthora species all around the world in a variety of different ways, and some of these pathogens have caused tremendous damage to plants and trees which have no natural defences or resistance to them.

In Britain, Phytophthora outbreaks are a concern not only for commercial foresters and woodland managers, but there is also evidence to suggest that they pose a serious threat to some moorland plants.





In Brief

Phytophthora infections have been found in a variety of different plant species, and the consequence of infection is frequently fatal to the plant. Heather has not been affected by any of the various forms of the disease, but it is not impossible that this could happen. The current concern surrounds Phytophthora's ability to infect and kill juniper and blaeberry, the latter being one of a few plant species which is able to transmit the disease over a large scale after infection.

At the time of writing (October 2016), there are no cures or preventatives for Phytophthora infections. The best advice is currently to practice good biosecurity, be vigilant and conduct frequent checks on trees and undergrowth (particularly Japanese larch, Rhododendron and blaeberry). Landowners should be prepared to have to kill and remove potentially large areas of vegetation as and when an outbreak occurs in order to prevent the spread of the disease.

Different Phytophthoras specialise in attacking different plant tissues. Some attack mainly roots and the root collar, operating largely out of sight underground. Others are aerial pathogens, attacking leaves, shoots and bark, producing spores on these tissues which then spread in moist winds and driving rain.

Types

There are several distinct species of Phytophthora in Britain. Four of the most significant from the perspective of the moorland manager are *P. ramorum*, *P. kernoviae*, *P. pseudosyringae* and *P. austrocedrae*. It is important to note that these species have all been deemed "unlikely" to have a direct effect on heather, although they remain a potential concern.

For now the main threat is currently directed towards blaeberry (called bilberry in England), *Vaccinium myrtillis* cowberry *Vaccinium vitis-idea*, and juniper *Juniperus communis*, all key components of a healthy moorland ecosystem.

Phytophthora Species

Phytophthora ramorum

- This *Phytophthora* species has so far infected around one hundred and fifty different plant species and is a particular threat to the commercially grown Japanese larch tree.
- The effects of disease caused by *P. ramorum* have been described as “Sudden Oak Death” in the USA, due to the impact on their native oaks. In Britain, the impact of *P. ramorum* on our native oaks has so far been largely inconsequential.
- *P. ramorum* has been found to have infected blaeberry at a very limited number of sites in the UK and in at least one other European country.
- There have been no records of *P. ramorum* causing damage to heather.

Phytophthora kernoviae

- *P. kernoviae* is a slightly more recent arrival in Britain, having been first discovered in 2003.
- *P. kernoviae* is believed to be a more virulent species than *P. ramorum*, particularly when it is associated with rhododendron plants.
- *P. kernoviae* was first found to have infected blaeberry in Cornwall in 2007, and since then more infected sites have been found.
- There have been no records of *P. kernoviae* causing damage to heather.

Phytophthora pseudosyringae

- *P. pseudosyringae* was first discovered in 2005 when it damaged blaeberry plants in ancient woodlands on Cannock Chase in Staffordshire.
- The species has probably been present in Britain for decades although its origins as a native or introduced species are uncertain.
- The effects of *P. kernoviae* and *P. pseudosyringae* on blaeberry has been called “bilberry blight”.
- There have been no records of *P. pseudosyringae* causing damage to heather.

Phytophthora austrocedrae

- This species was first identified in Argentina in 2007.
- *P. Austrocedrae* primarily attacks the roots and stem bases of juniper, causing symptoms of dieback.



Spreading Phytophthora

Phytophthora is a fungus-like organism, producing millions of spores in an attempt to reproduce itself. The majority of plant hosts infected by Phytophthora will suffer some damage as a result of the disease, but for most host species, the pathogen will reach a dead end.

However, some plant species like rhododendron and larch are known as “sporulating hosts”, meaning that they can emit spores over larger distances.

With aerial Phytophthoras such as *P. ramorum* or *P. kernoviae*, spore spread is likely to occur over relatively short distances (a few metres) and short distance spread from those plants is then possible through direct leaf contact, rain splash or through water pathways.

Scientists have found that there are broadly two different types of microscopic spores produced by Phytophthora.

- The first type of spore is called a zoospore, a short lived but prolific structure which can travel in the air. This is the spore type which is readily moved. It can be washed around by rain and blown long distances by moist winds. Zoospores can also be moved between areas of woodland in soil or infected leaf litter that sticks on the soles of walking boots or in the tread of vehicle tyres.
- Because of its algal-like characteristics, Phytophthora zoospores thrive in damp, humid environments and can actively swim in water films. Windy, mild conditions are ideal for their spreading.
- Excessive exposure to Phytophthora spores can cause damage to other plants which are would usually unlikely to be affected. For example, in areas where rhododendrons or Japanese larch are heavily infected and are emitting a high volume of spores, even the robust sitka spruce can contract the disease.
- A second type of spore is much more resistant; depending on the Phytophthora species these can either be chlamydospores or oospores. In *P. ramorum*, chlamydospores are thick-walled ‘resting’ spores, which are associated with root systems, and can lie dormant in infected tissue in the litter layer or the soil underground for extended periods, even after the infected plants have died and been removed. In contrast, *P. kernoviae* produces oospores which may infect germinating seeds or new plants which are transplanted to the site.



Identifying Infected Plants

Phytophthora creates conspicuous symptoms on its host plants. In trees, trunks, branches and roots can appear to bleed from black “cankers” on the bark or around the roots. Leaves will become discoloured around the central vein, and it is usual among infected rhododendrons for spreading black patches to appear across the foliage, starting at the base and the tip. On larch, needle wilt and blackening can be distinctive.

For trees which have been totally girdled by bleeding “cankers”, death is usually quite swift. The pathogen causes the cambium and phloem (inner bark) layer to cease functioning, causing the plant massive water stress. In some cases, trees will be able to ‘repair’ themselves as quickly as the damage is caused, particularly if the infection is in the roots, but this inevitably causes an unsustainable level of stress. A tree which appears perfectly healthy can, in some cases, die within a year of infection.

- In blaeberry, black or bruised purple bands will appear on the stems of the plant. These will then spread downwards to the root and the plant will quickly die.
- Stands of blaeberry which have been killed by Phytophthora often look brown or red-brown, then damaged, naked stems are often a tell-tale sign during the following year when other plants begin to bud and leaf up.
- Blaeberry plants can be totally dead just three months after the initial exposure to Phytophthora.
- Cowberry is also vulnerable.
- It could be easy to overlook a small outbreak of Phytophthora in blaeberry, so it is important to keep a careful eye on stands of the plant, as well as regularly checking for more conspicuous signs of the disease in neighbouring trees and rhododendron plants.
- *P. austrocedrae* infections may extend to 50 cm or more up diseased stems.
- Infected juniper trees have foliage reddening and browning over all or most of the crown.
- An excellent photographic guide to identifying Phytophthora infections is available at <http://fera.co.uk/news/resources/documents/pests-disease-phytophthoraBilberrySymptoms.pdf>



Control Measures

There are no known methods which can realistically be used to control Phytophthora other than in very targeted circumstances. No chemicals appear to kill the disease, and the most promising trials have only succeeded in suppressing it.

Best guidance issued by FERA in January 2016 recommend spot treatments with Timbrel or glyphosate, including a 10metre buffer zone around the infected plants. Where possible, burning vegetation in the vicinity of infection can be helpful, particularly if followed up with spot treatments of glyphosate. Cutting and removing infected material may help, but the risks of moving an infection around may mean that this is not recommended.

- The first line of defence is always to try and prevent entry of any disease. To this end, familiarise yourself with the biosecurity guidance available on the Forestry Commission, Fera and devolved administration websites.
- Control of the disease is usually carried out (under the terms of Statutory Plant Health Notices issued by the relevant authorities) by felling, killing and removing all infected trees and plants. Where practicable, destroying the remaining vegetation by burning on site or deep burial is also an option.
- Government departments are urging landowners to be vigilant and to be aware of the possibility that they may have to fell or destroy areas of trees and plants if an outbreak is identified.
- Particular attention should be paid to rhododendrons, and these plants should be frequently examined for signs of the disease.
- An Interdepartmental Programme Board, with representatives from Defra, the Forestry Commission and the Devolved Administrations oversee a programme aimed at containing and eradicating this disease.

If you believe that you have found evidence of Phytophthora on your property, don't hesitate to contact the relevant authority. Details are listed below.

England or Wales: FERA; planthealth.info@fera.gsi.gov.uk ; 01904 465625

Scotland: Scottish Government – Horticulture and Marketing Unit SEERAD Horticulture and Marketing Unit; hort.marketing@scotland.gsi.gov.uk ; 0131 244 6303 0300 244 9772

Northern Ireland: DARDNI; dardhelpline@dardni.gov.uk ; 028 9052 4999

The Heather Trust has been exploring the changing face of heather management for many years and we have uncovered a huge amount of information.

We are continuing to explore several themes discussed in this document in more detail, particularly relating to issues where cutting and burning complement one another to optimise habitat management. We will publish further Members' Briefings in due course.

We would be very pleased to hear from moorland managers who wish to share information relating to their management of heather.

For more information on heather beetle, visit the Trust's website, and remember to fill in the survey form to let us know about beetle damage.

Also, for the latest Natural England review into heather beetle research, see <http://publications.naturalengland.org.uk/category/4993022171283456>



THE HEATHER TRUST
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This is one of a series of guides put together by the Heather Trust to provide an overview on a range of topics that are relevant to people with an interest in the management of moorland.

Free for download from the Heather Trust website

