

Root disease in Alders

Science Summary SC010100/SS1

A 10-year research project, funded by the Forestry Commission and the Environment Agency and undertaken by Forest Research, has investigated the disease 'Phytophthora', which affects the roots of alder trees. The research determined the distribution and severity of the disease and explored methods for management.

Alder trees colonise bare, open ground rapidly and have a great ability to tolerate wet sites. The common alder plays a vital role in riparian ecosystems and the root system helps to stabilise riverbanks. In 1993 a previously unknown and lethal disease of alder, caused by a type of plant pathogen known as '*Phytophthora*', was described in southern Britain.

'*Phytophthora*' is found in many locations, but it is now known to be widespread on the riparian alders of southern England. The 10-year annual survey of alders in fixed plots alongside rivers over 8 metres wide, carried out between 1994 and 2004, showed incidence of the disease has increased steadily over the years. The disease may be locally damaging, and pose a serious threat to alder and the stability of riparian ecosystems.

We need to understand how to limit the spread of the disease when undertaking river maintenance activities and considering environmental design requirements for capital schemes. The following paragraphs, based on the results of the research project, summarise what we know about the disease (its appearance, spread and scale) and make recommendations on how it can be managed.

What does the disease look like in alder trees?

To date, the disease has only been recorded on the common and grey alder species. Diseased trees have the following symptoms:

- leaves are frequently abnormally small, yellow and sparse in mid to late summer;
- the lower part of the stem (2 to 3 metres above the ground) is often marked with black or rusty coloured exudates known as 'tarry spots';
- leaves may fall prematurely;

- the fine twig structure, the bark and eventually the trunk begin to break up;
- narrow strips of bark remain alive, supporting limited growth of new shoots from the trunk and large branches.

There may be a time delay of several years between infection and visible evidence of the disease.

How does the disease spread?

The disease is spread through microscopic disease spores (zoospores) that disperse via river systems and in soil. Environmental factors are important in the spread of the disease and it seems probable that infection may be linked with flooding or other types of disturbance (including human activity).

The disease is less frequent in trees further away from the water's edge, indicating a strong influence of distance from water. However, where young seedling alders establish on the exposed floodplain soils at a distance from the river, many eventually succumb to the disease, possibly becoming infected after episodes of flooding.

The research uncovered evidence that the pathogen can be found on alder plants that have become infected in the nursery. To limit the possibility of buying infected plants, trees should only come from nurseries where good practices are followed, including:

- no irrigation in the nursery with river water;
- at least one growing season inspection of plants to look for *Phytophthora* symptoms;
- routine disinfection of the area of the nursery before new alders are introduced;
- no replanting of alders for three years where diseased alder plants have been growing;
- information about the use of *Phytophthora*-controlling fungicides on plants prior to sale as these may suppress symptoms developing in infected plants.

What is the scale of the disease?

The 10-year project on riparian plots in the southern half of England and east Wales on rivers showed that:

- in 1994, 4.3 per cent of the stems that were assessed were diseased or dead, with a small proportion of the dead trees killed by causes other than *Phytophthora*;
- in 2003, 15.3 per cent of the total was diseased or dead.

Phytophthora is now present throughout southern England and in parts of Wales, while reports of the disease from northern England and Scotland are increasing. The 10-year survey showed that the disease incidence is highest in south-east England; however, heavy losses are occurring in some of the large alder populations along western rivers. It also showed that in some areas the increase in infected trees was rapid and all are now diseased, while in others there was little or no increase in disease levels during the study.

How can the disease be managed?

Tree removal

It is not recommended that time and resources are spent in attempts to eliminate the fungus through the felling or winching out of affected trees. These operations cannot be conducted in a sufficiently comprehensive way to be effective. On riparian sites, the disturbance created by this activity may even spread the disease.

Coppicing

Coppicing is an option for disease management as it gives trees the opportunity to regenerate new growth, and prevents diseased trees from becoming unstable and causing damage to the anchoring riverbank. Ideally, trees should be cut for coppicing 20–30 cm above ground level, leaving a tall stump to develop new shoots under favourable space and light conditions. Studies on the potential for disease management through coppicing showed that following coppicing health and vigour of the regrowth remained healthy, although fewer shoots regenerate from the stumps of diseased trees compared with healthy. Stumps cut from trees with entirely dead crowns were sometimes able to resprout, although the number and vigour of the sprouts was lower than with the healthy stumps.

Replanting with alternative species

Planting alders on sites liable to river flooding, near to areas where diseased alders are known to occur, presents a high risk. While alder is often the most suitable genus for a variety of reasons, owners should take account of the threat of disease, and consider other flood-tolerant species, such as willow, as replacements or as a mixture. Special care should be taken not to introduce the pathogen to remote riparian sites. Here it should be noted that natural regeneration of alder from seed occurs readily (although the young plants may need to be protected with a stockproof enclosure). Encouraging natural regeneration may be a preferable option to planting.

This summary relates to information from Science Project SC010100, reported in detail in the following output:

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