

RECOGNITION
and CLASSIFICATION of
*Neonectria
fuckeliana*
CANKERS



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Nectria Focus Group



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CONTENTS

INTRODUCTION	2
OBJECTIVE	3
NECTRIA FLUTE CANKER	4
Absent	5
Slight	5
Moderate	6
Severe - single flute	8
Severe - multiple flutes	10
Basal fluting	12
Stem depressions	14
Fruit bodies	16
NECTRIA CANKER and BRANCH SIZE	17
INTERNAL DAMAGE	20
White wood	20
Encased bark columns	22
SAMPLE COLLECTION	23
Contacts	23

Disclaimer: This Field Guide is intended as an educational tool. Application or interpretation is up to the discretion of individual users.

INTRODUCTION

Stem malformation, typically developing after pruning, has become a problem in some *Pinus radiata* plantations in part of the South Island of New Zealand over the last 15 years. Infection, primarily through the pruned branch stub, may result in extensive stain and decay within the stem although tree crowns remain green and healthy. *Neonectria fuckeliana*, a Northern Hemisphere fungus which is commonly recorded there as a saprophyte or weak pathogen of species of *Picea* (spruce) and *Abies* (fir), is the most commonly isolated fungus from affected trees. *Neonectria fuckeliana* had not been recorded in New Zealand prior to 1996, although it is apparent that it was present for some years before this. The disease has become known as Nectria flute canker.



OBJECTIVE

The objective of this field guide is to assist in the identification and classification of *Nectria flute* canker symptoms with particular reference to trees being assessed for pruning or for disease incidence. The guide also shows characteristics of internal stem damage and fungal fruit bodies. It is anticipated that the guide will facilitate the field diagnosis of disease occurrence and severity both within known infested stands and in stands outside the known infested area. Recognition of symptom severity by age class and silvicultural treatment will assist forest managers in disease incidence assessment and selection of trees for pruning operations. The guide is also available in electronic format that will allow users to construct their own strategy-specific guides for tree selection or disease assessment purposes.

NECTRIA FLUTE CANKER SYMPTOMS

Stem cankers or 'flutes' range in size from minor depressions, to flattened areas of the trunk, to deep incisions that may extend for more than a metre in length. However, natural depressions that mimic *N. fockeliana* infections but are unrelated to any damage to the cambium or sapwood may also occur. Fruit bodies of *N. fockeliana* are distinctive but do not form on all infected trees.



The following descriptions are given to assist with disease categorisation:

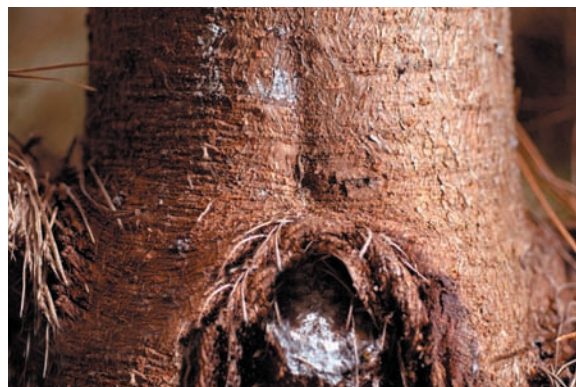
Absent

Indentation or dimple typically associated with a normal branch stub. Not considered a symptom of disease. Current recommendation is to ignore such minor depressions in disease incidence assessment or pruning decisions for subsequent lifts.



Slight

Flute or depression not obvious, and extending less than 5 cm above branch stub. Such symptoms may be associated with Nectria flute canker. Trees with these symptoms are not considered at high risk from pruning if limited to a single branch within a whorl. May or may not be included as a potential Nectria positive for assessment purposes.



Moderate

Flute well defined and extending more than 10 cm above branch stub is considered likely evidence of Nectria flute canker. Current advice is not to undertake second-lift prune on these trees.



Moderate



Note: Stub has been treated with a fungicide/protectant, hence the colour.

Severe - single flute

Extensive single flute which is more than 1 cm deep associated with large branch (> 4 cm diameter) is indicative of severe Nectria flute canker. Trees showing such symptoms are not recommended for further pruning.



Severe - single flute



Severe - multiple flutes

Multiple deep extensive flutes indicate the most severe incidence of Nectria flute canker, and it is not recommended such trees be second-lift pruned or included in the final stand stocking.



Severe - multiple flutes



Basal fluting

Basal fluting is sometimes recorded in field surveys of *N. fockeliana*. *Neonectria* is sometimes isolated from discoloured sapwood, usually in association with other fungi. In other trees the sapwood is not colonised with fungi and the flute probably reflects a root problem in the affected quadrant. Whether trees with basal flutes should be avoided when selecting trees for pruning is currently unknown.

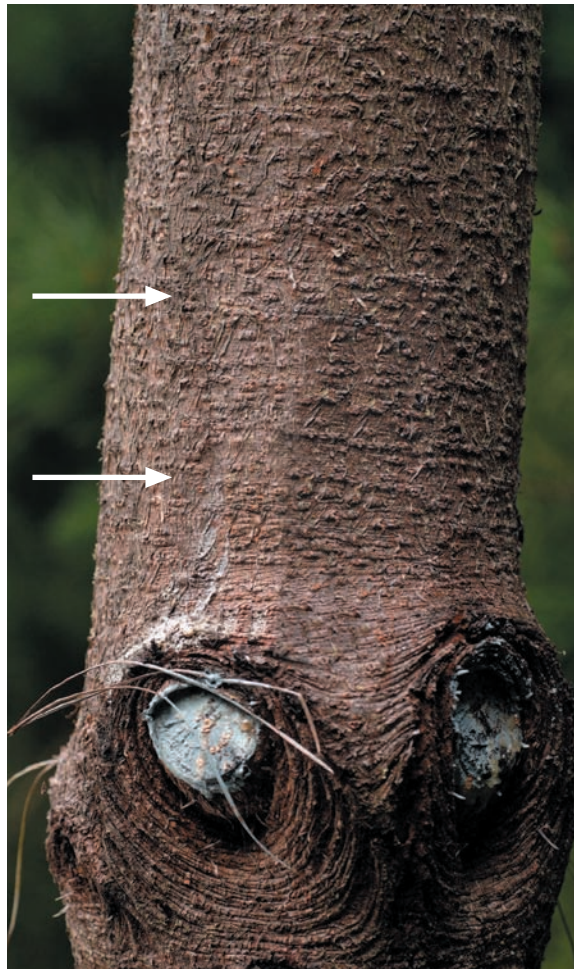


Basal fluting



Stem depressions

Non branch-related stem flattening or depressions may or may not be related to Nectria flute canker.



Stem depressions



Fruit bodies

Distinctive red (fresh) and rusty brown to blackish (aged) fruit bodies can be found on pruned branch stubs and the bark of infected trees. However, trees may be infected, and severely cankered, without the formation of fruit bodies.



NECTRIA CANKER DISEASE AND BRANCH SIZE

Research trials have shown pruned branch diameter to be strongly related to subsequent *Neonectria* infection. Branches over 3 cm diameter have a much greater probability of canker development than those under 3 cm. Infection of large branch stubs can be reduced by the immediate application of a suitable fungicide to the cut surface. Branch size is therefore important in the selection of trees to be pruned. The likelihood of infection of pruned stubs can be reduced by pruning in summer.

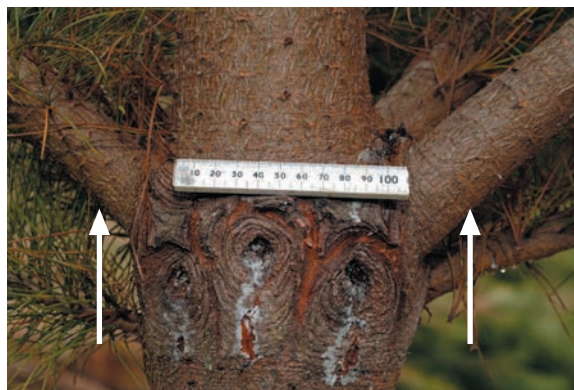
Typical small branch diameter whorls (both pruned and un-pruned) are considered at low risk of *Neonectria* infection.



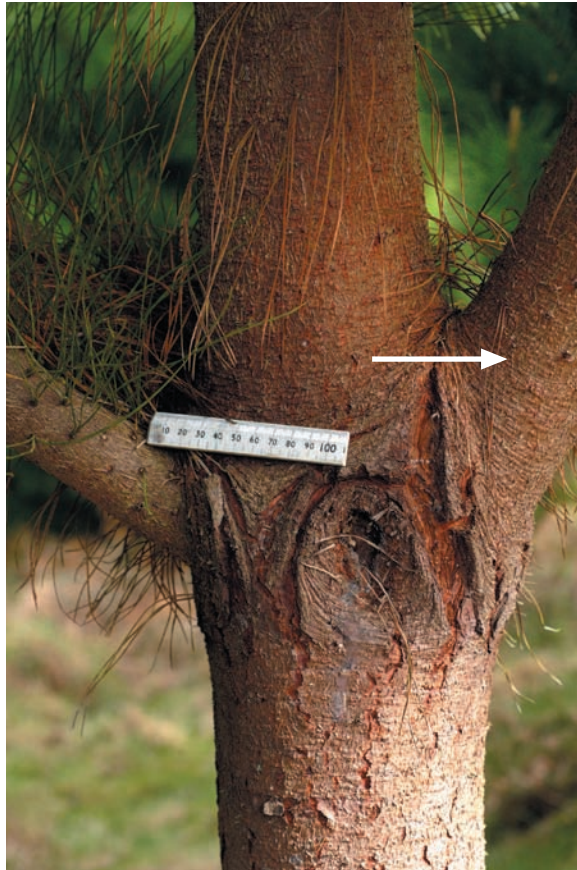
Branches less than 3 cm diameter are considered at low risk of infection by *Neonectria* following pruning. Current recommendation is to prune without any further treatment (fungicide application).



Branches greater than 3 cm diameter are of higher risk of *Neonectria* infection following pruning. Current recommendation is to either not prune trees with large branches, or to treat the pruned stub with a fungicide.



Typical large branch within a whorl that is at high risk of *Neonectria* infection after pruning.



INTERNAL DAMAGE

Neonectria infection has been found to be associated with changes to the internal structure of the stem.

Sapwood colonised by *N. fuckeliana* can develop a grey/brown stain. It can also be associated with dry whitened wood. Although *N. fuckeliana* does not decay the wood, infection can facilitate the entry of decay fungi which can lead to the formation of pockets or columns of decay. This decayed wood is attractive to insects such as huhu (*Prionoplus reticularis*) though these do not colonise beyond the decayed region of the stem.



Typical staining and white wood often associated with *Neonectria* infection.

In extreme cases columns of internal decay within the stem follow the *Neonectria* infection.



At harvest, the effects of *N. fuckeliana* infection on wood quality become apparent. Even minor external symptoms such as narrow bark cracks, which may be the result of occluded cankers, can be associated with substantial internal defects as indicated in the photos. Some examples include encased bark, resin pockets, areas of stain, patches of whiter than normal sapwood and a larger defect core. There may also be small contained patches of decay. In contrast, large stem depressions are not always directly associated with dead or stained wood although they may be the result of earlier infection.

Encased bark columns

A large diameter defect core from *Neonectria* infection and fluting earlier in the rotation. Some columns of encased bark and contained decay are also visible.



External bark crack

Sometimes minor external bark cracks may indicate extensive internal defect such as encased bark.

Lower stem depressions

At harvest, large stem depressions are not always associated with dead or stained wood.



SAMPLE COLLECTION

The confirmation of the presence of *Neonectria* infection in suspect trees and in new areas requires the collection of samples from which the fungus can be cultured in the laboratory. Successful culturing can be enhanced by sampling the most appropriate site and careful treatment of the sample following collection.

For standing trees, suspected *Neonectria* infection should be sampled by increment core taken approximately 5 cm above the branch stub within the area of symptom. Samples should be wrapped in plastic film, kept in cool conditions, and forwarded to Scion for diagnosis at the earliest opportunity. Information on the forest, stand, site, coordinates (e.g. lat/long or NZ Mapgrid), tree management, and symptoms, along with the collector's name and contact details should be included with the sample.

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FIELD NOTES

